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OUTLINES

OF A

NEW PLAN

FOR

TILLING & FERTILIZING LAND.

BY

THOMAS VAUX.

LONDON:

WHITTAKER & Co., AVE MARIA LANE.

1840.

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deride and oppose for a while, it will surely be adopted, and will, ere long, effect a most beneficial revolution on the face of the earth, (where practicable) and in the condition of mankind. It will by and by effect as great a change in agriculture, as the application of steam has done in manufacture and in navigation.

The system now sketched out, whenever it shall be brought into active and general use, will be found to be equally productive of vegetable substance, and of animal support, and will supply a larger quantity of the great prerequisites of all vegetable and animal support, than has ever yet been supplied by any system of agriculture, that is, of rich manure, and a fruitful soil. The great Author of all nature has always intended that mankind should be supported by the fruit of the soil, and that only by means of human art and human industry, when they are rightly applied. A great part, and, indeed, the greater part of the surface of the earth, is destitute of that kind of covering which is required for useful vegetation, and especially for the support of mankind. The first prerequisite, therefore, to the improvement of that greater part, is the production of such a covering; and no system hitherto in operation has been adequate for such a purpose, more especially on wet, cold, and clayey soils, on bogs and moors, and on the sides of mountains. But the system, hereafter to be laid down, will, in its continued operation, clothe such parts of this world's surface with a fruitful soil, and with a luxuriant sward, the one containing abundant harvest, and the other bearing fleecy flocks, supplying an abundance both of food and clothing for the use of man.

And let it be remembered, that while the growing of grain, hemp, flax, potatoes, and the like, must always impoverish the soil, without providing for its annual renovation by manure, the growing of turnips and mangel-wurzel will always enrich the soil, especially when the produce is consumed on the spot, and most of all when eaten by sheep who are retained thereon. It would seem as though Providence had intended for sheep, turnips, and ashes to be the great means of improving the land in cold and damp situations, and in mountain districts, as, in truth, no other means have ever yet been discovered that are adequate for that purpose. Fire must go the foremost in reclaiming waste land, as in manufacture and navigation. Ashes must prepare the way for the growth of the turnip; the turnip must support the sheep, and the sheep, in its turn, will not only supply an abundance both of food and clothing for mankind, far beyond what can be supplied by any other animal, but will supply a rich manure, and a fruitful soil, and that very far beyond what can ever be supplied by any other means yet known.

But to amplify the argument a little, the manure of sheep is the most valuable of all manures, and, instead of it being, like bone and rape manure, obtained at a great expense, there will be *a profit in* *obtaining* it, and in far greater quantities than any other. In like manner turnips and mangel-wurzel will produce a larger transmutation of the surrounding elements, into vegetable matter, than any other produce will do; and in feeding sheep, a larger transmutation of vegetable matter into animal matter, and, of consequence, a larger deposit of animal and vegetable decomposition in return, which is the richset manure with which the surface of the earth can be enriched. We will repeat it then, that fire and ashes, sheep and turnips, are the great agents which mankind may employ the most successfully in the cultivation of the waste places of the earth, and in the entire conversion of a dreary desert, into one unbounded field of plenty, and a field that would be equally productive of vegetable and animal support, and be alike adapted to the benefit of cattle, and to the happiness of mankind.

If the present system of agriculture were to be persisted in much longer in Europe, animal food would be entirely removed beyond the reach of all the working classes of society, and yet it is demonstrable that the more mankind may live upon corn, potatoes, and on such productions as will impoverish the earth, without supplying any adequate means for its annual renovation, the smaller number of inhabitants will the earth be able to support; while, on the other hand, if winter cattle food were cultivated in the way proposed, and if sheep were to be propagated and supported as it will be laid down in the following outlines, and the waste parts of the country were only brought into cultivation, as therein proposed, a larger and more abundant supply of animal food would be afforded to all classes of society, and by that means the soil would be enabled to support the largest number of inhabitants. In Great Britain where more animal food is eaten than in any other part of Europe, the quantity consumed will not average a quarter of a pound a head per day. In France the average is lower than in England, although much higher than in any other country on the continent of Europe, for Holland and Belgium are continually drained to meet the necessities of France. The poor of other countries on the continent of Europe, must hardly know the taste of animal food, and more especially the taste of fresh butcher's meat, and under the present system of agriculture, the supply of animal food must be always on the decrease, while population must be always on the increase. But what will be the condition, by and by, of even England, on our present system, and with a rapid increase of our population? It must, we think. be evident to every ingenuous and reflecting person in our land, that unless the system here laid down should be happily adopted, in the following generations of even our own country, the labouring classes of society will have only a dimished and continually diminishing supply of animal support.

If the government of our country had but held out the very same encouragement to improvements in the art of agriculture, as it has done to improvements in other useful arts and manufacture, we should no doubt have witnessed as great improvements in the one as we have done in the other, and the face of our country would have worn a covering of equal splendour with the machinery and manufacture of our day: but for the want of such improvement in the cultivation of the soil, the very great advantages arising out of our improved machinery and manufacture, have been partly lost, as we have had to import the produce of other countries for our animal support, and to import them under the most weighty disadvantages. Improvements in all other useful arts and manufacture have had every encouragement which the government could afford, both by national patents, and by public bounty: and in consequence thereof the authors of such improvements are now among the most wealthy commoners of our land. Only let our country extend her national protection and support to agriculture as it has done to other useful arts and manufacture; and afford the same protection to all improvements in the *system of agriculture* as it does to all improvements in the manufacture of their produce; and then the surface of our country will soon be equal to the glory of its own commercial wealth.

National wealth acquired only by manufacture, trade, and commerce, will always have many heavy drawbacks on the happiness of society, as our poors' rates and expenses for criminal prosecutions, and a thousand other evils would be ready to attest: but national wealth, when acquired by agriculture, will always be found to have the least of social alloy, and to be the most congenial to the highest interests of mankind. But the highest state of national prosperity is not to be obtained or to be acquired by agriculture when unaccompanied by commerce, and by manufacture, yet even in that case our country may now be in equal possession of *all* those means of acquiring wealth and national prosperity, only let her patronize improvements in agriculture as she has done those of other arts and manufacture, and her greatness will be consummated; in a word, only let the system here proposed, be brought to bear on the waste lands of Great Britain and Ireland, and in a little while, " the wilderness and solitary places will be glad, and the desert will rejoice and blossom as the rose." In Britain, it shall then be said, " Thou crownest the year with thy goodness; and thy paths drop down fatness. They drop upon the pastures of the wilderness: and the little hills rejoice on every side. The pastures are clothed with flocks; the valleys also are covered with corn; they shout for joy, they also sing."

INTRODUCTION.

THE discovery which it is the design of the following pages to develope *(and for which Patents have been obtained for Great Britain and the Colonies,)* &c. &c., is a mode of recovering and improving land, particularly waste and poor land, by tilling and sowing, or planting only *small portions;* leaving *the other parts* in grass or other vegetable pasture. Winter food for cattle is then obtained, and also a good and clean surface for sheep to tread and lie on.

Turnips and other vegetable substances suitable for feeding sheep, are, it is well known, grown on lands where they cannot be fed off without many and great disadvantages. Consequently, such vegetable substances have in almost all instances to be drawn and carted to the homested, or to grass land which affords a suitable surface for sheep.

And it is equally well known that it would be of great importance, to feed off the crop where grown; such a course being not only a considerable diminution of labour, but also causing by the manure of the sheep a vast improvement in the soil.

This invention effects both these objects. By it sheep will be enabled to feed off the crops produced thereon, and have at the same time a surface which they can walk and lie upon, without the necessity of their running over and reposing on the tilled portions of the land.

Suppose it to be desired to improve a piece or *parcel* (say ten or more acres) of very poor or waste land, to which, if tilled in the ordinary manner, turnip husbandry is not applicable; that is, if it be too wet for sheep in winter. The plan is also applicable to lands of a better quality.

The process is as follows: Begin by paring off about one foot square of the turf, sward, or vegetable surface, and then at an equal distance, (that is, about one foot square) pare off and remove another square of about one foot of the sward or other vegetable surface; and so proceed in like manner throughout the whole ten acres, leaving the other parts or remainder in its original state. By this means, there will be one-fourth of the ten acres pared, and three-fourths remaining with its sward or vegetable surface unremoved, and every square so pared, will be surrounded or encompassed by the original turf or vegetable surface, as is exemplified in the drawing No. 1, the parts thereon painted green, representing the original turf or surface unremoved; and the squares left white and marked *a a a* representing the portions pared off. Or the dimensions of the tilled parts may be twenty-four inches square instead of twelve.

In order to raise a full crop, these will be the proportions at the first working. And although only one-fourth of the soil will be tilled at the commencement, yet the whole may, if desired, in the course of a few years, by degrees be tilled.

Having pared off the turf as above-mentioned; the parts from which this has been done, should be tilled to such depth as the soil admits, say from six to eight inches deep, or more if desired, and the earth or mould so tilled spread over the adjoining spaces of sward or pasture, in order to its being PULVERIZED, such pulverization being greatly aided by exposure and atmospheric influence, care being taken not to let it remain so long as to injure the pasture. When the soil is clay or of a clayey nature, in order to take advantage of the beneficial effects which frost produces, care must be taken not to lose or endanger its benefits, by allowing the mould or earth to remain too long on the sward or pasture. The tilled earth should, with hoe or shovel, be drawn into small heaps, each containing as much as will fill one *hole*, and the mould may afterwards be again turned over upon a fresh part of the adjoining sward, whereby all danger of destroying or injuring the pasture will be avoided; or the earth may in the first instance be placed in small heaps, instead of being spread out; and on their becoming congealed by frost, they should be turned over occasionally. The grass will prevent the uniting of the tilled and the untilled earth. The best disposition of the sods, especially when these operations are commenced in the autumn or early in the winter, will be to place them in the holes, (one sod in each) first rolling or folding them into a cylindrical form, and placing them upright on edge, where they may remain until the earth is returned into the holes, when they may be taken out and placed upon it; (still keeping them on the edge) and there remain until the time arrives for reducing them to ashes.

As paring off the turf with the implement known under the several names of paring spade, breast plough, denshering spade, flaughter spade, &c. &c. is but little practised in many parts of the country, the following mode may be substituted.

The turf may be separated from the spit or mould at the same time it is dug, in most cases by a single stroke of the spade, for that purpose one may be used with a sharper edge than the ordinary digging spade, and this part of the work may be performed by boys and old men, or women when pulverizing the earth. Should too much earth at the first operation be left with the turf or sod, it can be separated afterwards, when drier, and previously to the turf being reduced to ashes. In burning the sods, care should be taken not to raise the heat to a higher degree, than is requisite to produce combustion in its mildest or slightest form. This may be best effected by making the heaps of turf small, such as will yield about two bushels of ashes, and whilst burning they should be kept in a smothered state.

The ashes should be equally apportioned amongst all the tilled squares; or if the land be tilled in stripes, then they should be distributed, so as to appropriate a due proportion to each plant.

Many persons have great objections to paring and burning the sward, it will therefore be satisfactory to observe that it will be necessary on waste lands only; for wherever there is ley, there is in the same farm, other land in tillage on which the farm yard manure is applied. Instead, therefore, of using it on the fallow or otherwise, as at present, it may be appropriated to the raising of winter cattle food (turnips, mangel-wurzel, &c.) on *poor pasture land; paring and burning will, therefore, only be resorted to in preference to carting manure too great a distance.*

When the turf is not converted into ashes, it may be placed at the bottom of the tilled part, where it will answer an excellent purpose as manure; thus showing, that paring and burning are indispensable on *waste lands only.*

These operations being completed, sow or *transplant* in the proper season, say from April to July, *the Swedish turnip*, cabbage, or mangel-wurzel, one plant in each of the tilled spaces or parts marked in plan, figure 1, *a a a*, and four plants in each square of twenty-four inches, taking care in the latter case to place each plant not less than three inches from the side of the untilled ground. This will leave the four plants eighteen inches apart on the tilled portions, and thirty inches apart the other way.

TRANSPLANTING the Swedish turnip. In addition to many other advantages, is that of affording time to obtain fresh — newly burnt ashes when wanted, which cannot at all times be insured at the season when the *seed* should be *sown;* especially in the damp climate on the moors in the North of England and in Scotland. Those, therefore, who do not approve of transplanting, will do well to proceed with their operations of paring, burning, &c: in the autumn. In returning the ashes and earth into the holes or stripes, I recommend the ashes being placed nearly at the bottom of the holes. They will be sufficiently mixed with the tilled earth on stirring or turning it previously to sowing.

By any of those modes the crop produced will be found fully equal to any that can be obtained from the land had it been entirely disposed in tillage in the ordinary way.

It is necessary to observe, that as there will be a large quantity, especially the first year, of undecayed vegetable matter (roots and fibres) in the tilled portion of the ground, which, although an excellent manure, will cause the whole mass to be too light, unless proper means of avoiding it be adopted; it must, therefore, be well trodden down, and such treading or pressing must be proportionate to the quantity of this valuable manure, always bearing in mind, that when the quantity is *large*, the whole can hardly be too much pressed together or saddened, on peat and moory soils in particular.

In addition to treading, and as a means of preventing cracks, I strike ("job") a *spade* down between the tilled and the untilled parts.

On clayey soils, cracks or fissures, may, however, appear in dry weather between the tilled and untilled parts, especially on poor soils in ley, where there is but a small portion of vegetable matter, when after heavy rains the tilled parts will become panned. It will then, *on their first appearance*, be necessary to fill them up, otherwise the plants will suffer from drought. These cracks may be easily filled by the hoe, rake, or spade, and the expense is trifling. The spade may on some occasions, be made to answer a two-fold purpose, namely, when the tilled part has become sad, the bad effects of which may be obviated by stirring or moving the tilled earth, by striking a spade down between the tilled and the untilled parts, and pressing it gently back, and so making the whole lighter, and at the same time, fill up the cracks; I have done this with great advantage *after* the bulb of the turnip has began to form. And the extent or degree to which this lightening up of the soil may be carried will be easily ascertained by practice. Any measure short of causing the leaves to droop so that they would not recover in the course of one or two days, may not only be safely, but with great advantage adopted. This practice will be found very superior to that of hoeing.

As a considerable time will frequently elapse between the period of returning the earth into the holes, after its pulverization, and the period of sowing or *transplanting*, it will in the interval become sad; the mode of lightening it just stated must be adopted before commencing the sowing or planting.

When the earth is returned a long time before sowing or planting, it will not require to be trodden down as is recommended in peat and moory soils.

When the pasture presents grass in the spring, and previous to commencing the operation of sowing or planting the tilled parts *aaa* the grass should be fed off, in order to prevent its rising to such an height as to interrupt the growth of the turnips or mangel-wurzel, &c. This should be done again in the month of August.

At this latter period sheep or lambs may be let in, but only when hungry, and although they would do but little injury by lying amongst the turnips, it will be desirable not to allow them to do so. It will therefore be better to remove them as soon as their hunger is satisfied.

Towards the close of the year, the produce of the tilled parts, *a a a*, will be ready for feeding off, when such portion or quantity of the turnips, cabbages, or other crop may be drawn or pulled up as wanted for use and store. On this being done, some part, or the whole of the earth or soil in which they have grown, should be spread over the surface of the sward or pasture parts. By this means, when the sheep are feeding on the turnips, &c., they will trample upon it and pulverize the same, and when the crop has been fed off, the earth is to be returned, which, enriched as it then will be with the sheep's manure, will materially fertilize the soil for the next crop; and from the same causes the pasture parts, will also be greatly improved in quality, as well as quantity. And in order still further to increase it, instead of retaining the tilled parts from year to year in precisely the same places, it may be advisable, in each after the first, or once in every succeeding three or four years, to cut from one side of the several untilled parts a few inches, (say from four to six inches wide) of the adjoining turf or pasture, and then allow the grass on the opposite side of the tilled parts, to grow or spread to a like extent; or place the turf so cut off on the other or corresponding side, that is, place it on the opposite side of the tilled part from which it is taken; or grass seeds may be sown; and then till and treat the newly pared part as above described; by which means, in a few years, the pasture will be vastly improved, and become of a very superior character.

I would here also notice the very beneficial results which all persons acquainted with the art of agriculture will perceive must follow from spreading either a part or the whole of the tilled portion of the soil over the sward or pasture parts, in order to its pulverization, by the treading and manuring of the sheep, and then drawing such fertilized soil back again in the manner before stated. The advantageous results to be obtained thereby will be so great, that in this respect alone this mode of leaving portions of adjoining pasture surface for receiving the soil for pulverization, as well as for receiving the manure of sheep is of the utmost importance; and combined, as it is with the desideratum of the pasture offering a firm and good surface for the sheep to walk and lie on, (while consuming the produce of the tilled portion,) the system as a whole will be found very superior, and far more *economical*, than any of the modes heretofore practised for tilling and fertilizing all such soils as are not (when tilled in the ordinary way) sufficiently dry in the winter for the grazing of sheep, without injury both to them and to the land.

On very adhesive soils, in wet weather, the tilled earth or mould should not be spread over the sward or pasture parts *before* the sheep are brought upon it to consume the crop, as it would puddle and injure the soil, and starve the animal. The sheep should therefore be brought upon the clean sward to consume the turnips, &c., and the earth or mould immediately afterwards thrown over the dung, which will, by the operation of drawing the whole back with hoe or shovel,* be sufficiently mixed. But it will only be necessary to do this in wet weather: or about one half of the turnips, &c., might on such occasions be consumed without any of the tilled earth or mould being thrown upon the sward, and the other half could be eaten off afterwards, as soon as the weather became sufficiently fine to admit of the tilled parts being trampled upon without puddling.

Although I have particularized squares of one foot and of two feet as convenient spaces of each of the tilled parts or portions, variations may be made with advantage; and any of the plans as in the several annexed drawings numbered 1, 2, 3, 4, respectively may be adopted.

If at any time after two or three crops of turnips, &c., have been taken and eaten on the spot where raised, as described in the plans Nos. 1, 2, a greater proportion of summer pasture or of meadow be required, every alternate row of those of *two feet square* of the tilled parts may be sown with grass seeds, or some of the old turf placed thereon. This will leave a suitable breadth of sward for one swath, or two if desired. If not required for hay, the tilled part may be reduced to one foot by sowing seeds or placing old sward.

To accomplish the same object as regards mowing, when the land is laid out in squares of *twelve* inches, two rows adjoining each other of the tilled parts alternately should be sown with grass seeds, as shown in figure 4. To prevent the grass being blown among the turnips, whilst being made into hay, it should be removed immediately after it is mown.

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* A rake should not be used for returning the earth; as the finest particles would then be left on the grass.

In all deviations from the modes here stated, the plants should never be placed nearer each other than two feet, in consequence of the high state of fertility in which land may always be kept. If for instance, it be desired to have two rows of plants in one of the tilled *stripes* as shown in figure 3, it should not be less than thirty inches wide; and if three rows, four feet six inches, and if four rows, seven feet; that is, the outer rows should not be less than three inches from the untilled part and the plants two feet from each other. If no additional summer food or meadow be required, every alternate row may be planted with beans, hemp, or any other useful vegetable which will maintain an erect position till matured.

By either of the modes described in figures 1, 2, heath, ley, or other poor pasture lands may at once (in the first year) be made to support nearly ten times as many sheep in winter as they now do in summer. In order, therefore, to cause a *given quantity* of such land to carry as much stock in summer as in winter, about one half of the whole plot should be appropriated to rye, rape, tares, or other summer vegetable productions, (adapted to the support of sheep) tilled in stripes, as shown in figure No. 3.

This plan will afford an excellent opportunity for surface drainage, by having a grip or deep furrow on each side of the tilled stripes.

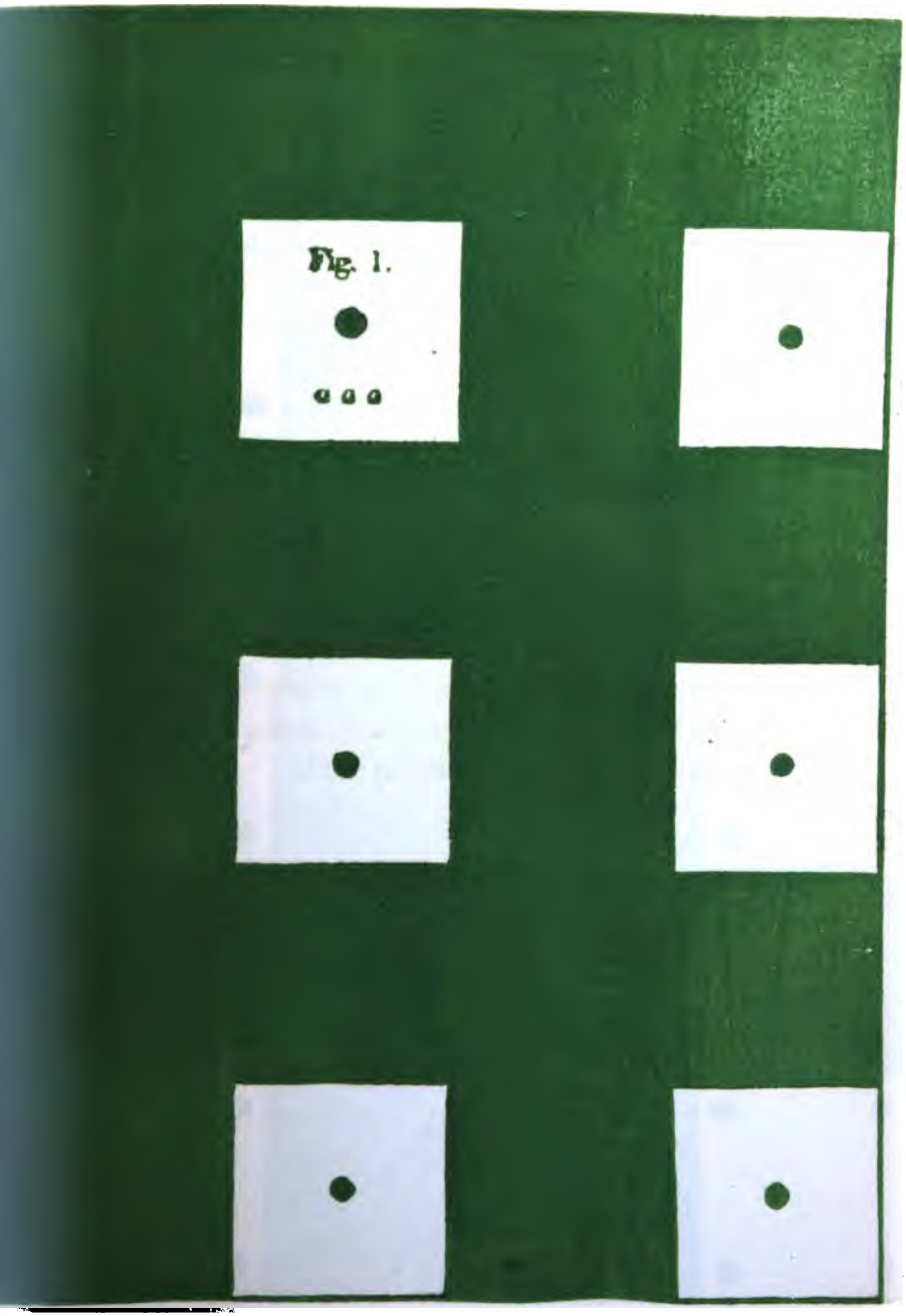
These, with the intervals of grass produced between the tares and turnips, and the *leaves* gathered from the turnips or mangel-wurzel, will support the stock during the six *summer* months.

The highly fertilized state which land thus treated will always be in, will enable the cultivator to grow two crops of cattle food in one year, raised by artificial means, on the tilled portion of the *stripes*—either two crops of tares or one of turnips and one of tares. When the latter mode is adopted, (which can seldom be but upon a small portion of the whole) the turnips must all be removed in October from that part on which tares are to be sown. In either case the winter tares will be ready for use, or rather consumed, in time to transplant the Swedish turnip or to raise a second crop of tares.

In feeding off tares in summer, the same mode of hurdling off or keeping the sheep together, should be pursued as is before recommended for consuming the turnips in winter. And it will be attended with this additional advantage, that in the summer season, the tilled land will be sufficiently dry to bear the treading of sheep without puddling. They may be penned on the tilled or untilled parts, as may be deemed most desirable for enriching either. The results of the summer tares and the winter turnip feeding will thus prove equally beneficial both as regards the fertilizing the land, and fattening the sheep.

This mode of tilling and fertilizing land is very cheap, expeditious, and simple as compared with the numerous ploughings and harrowings, &c. &c., of the whole surface, and the carting of dung, which are now indispensable. It possesses this additional advantage, the most valuable crops may be raised and fed off, from lands incapable, by any of the ordinary ways, of profitable tillage. The produce will also be progressively increased, with a yearly decreasing amount of labour. And I do not consider it too much to say, that thereby poor soils will become so rich that they will yield the utmost quantity of winter food for sheep and cattle that can be obtained from the best description of lands.

Fig. 1.



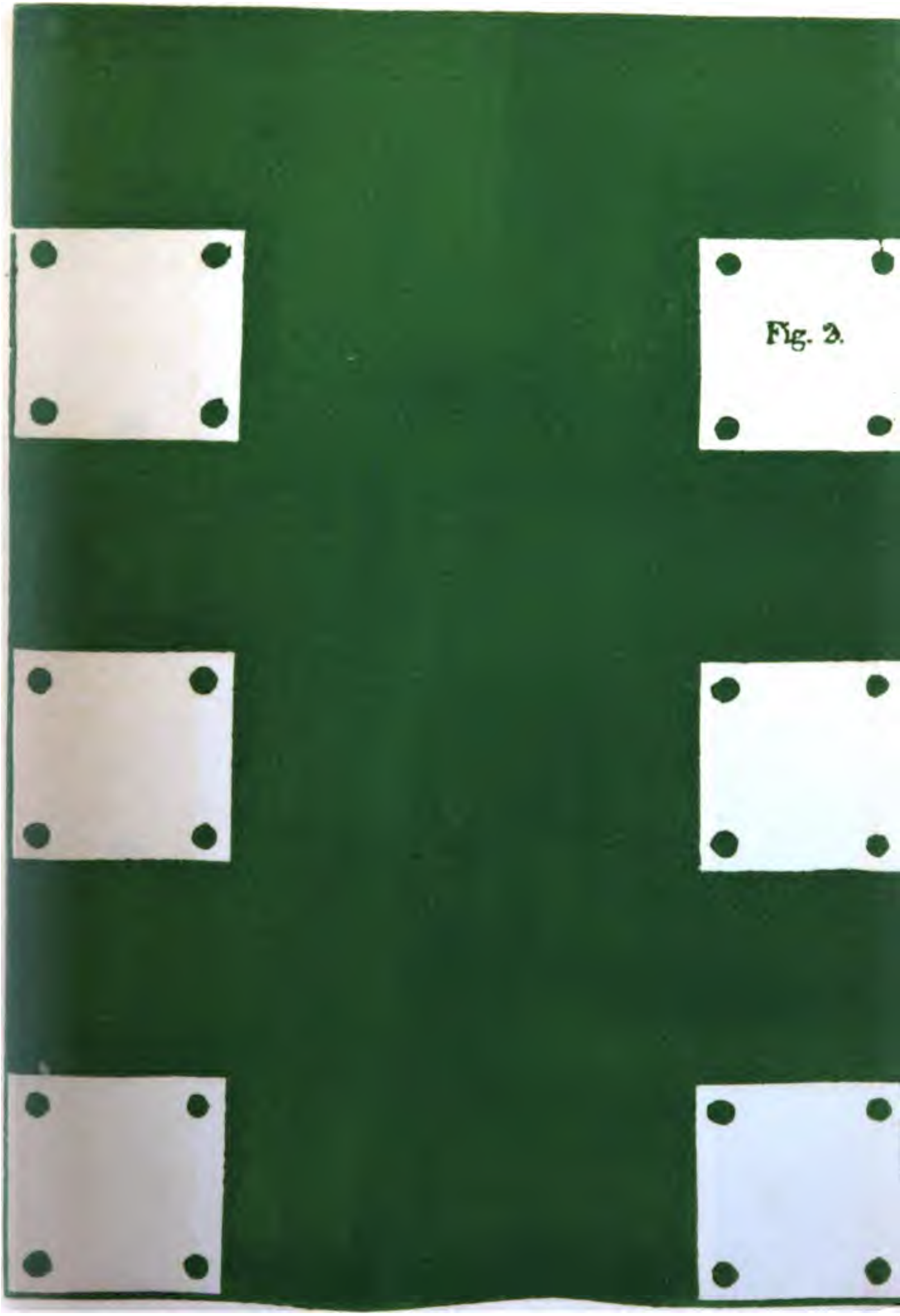


Fig. 2.

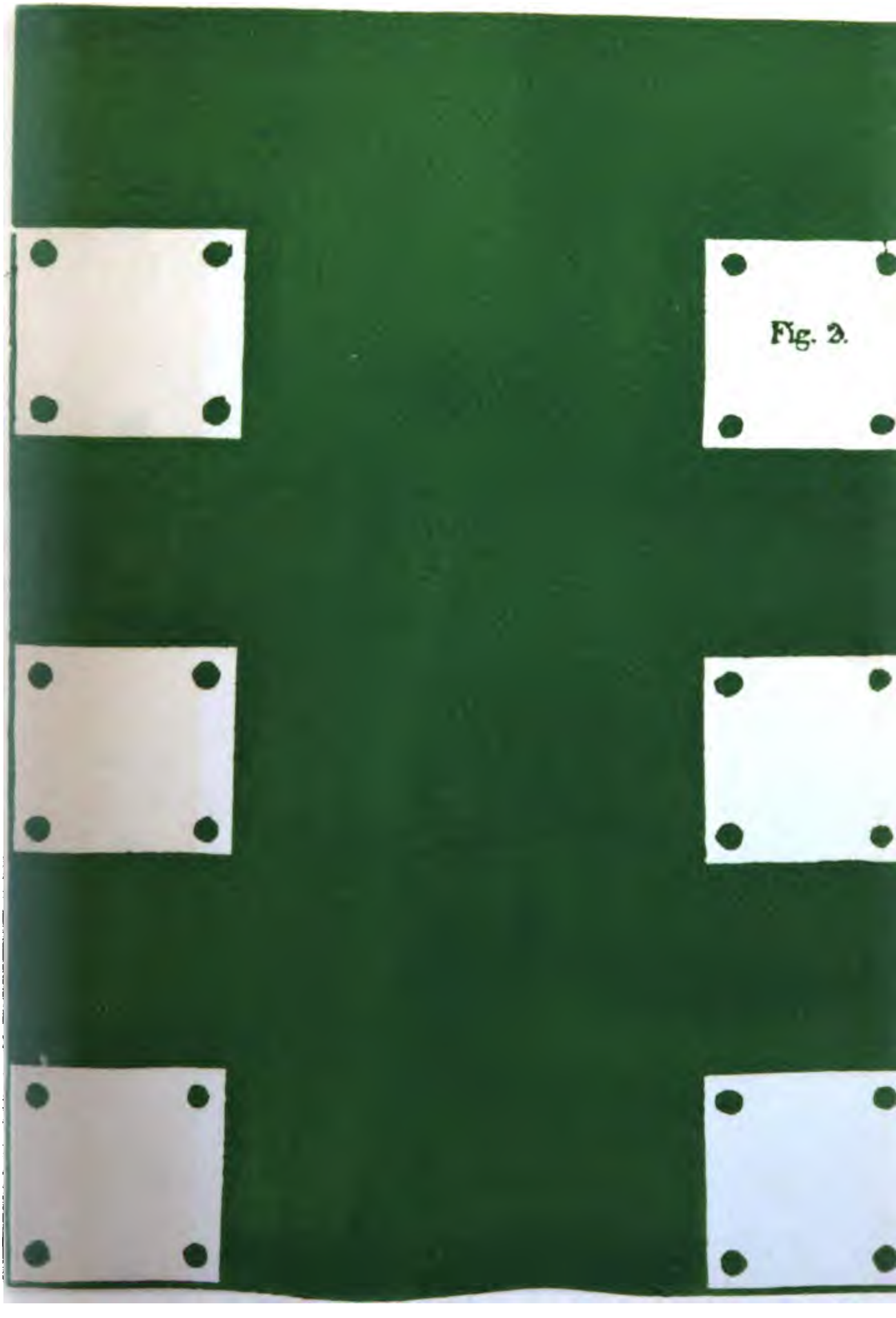
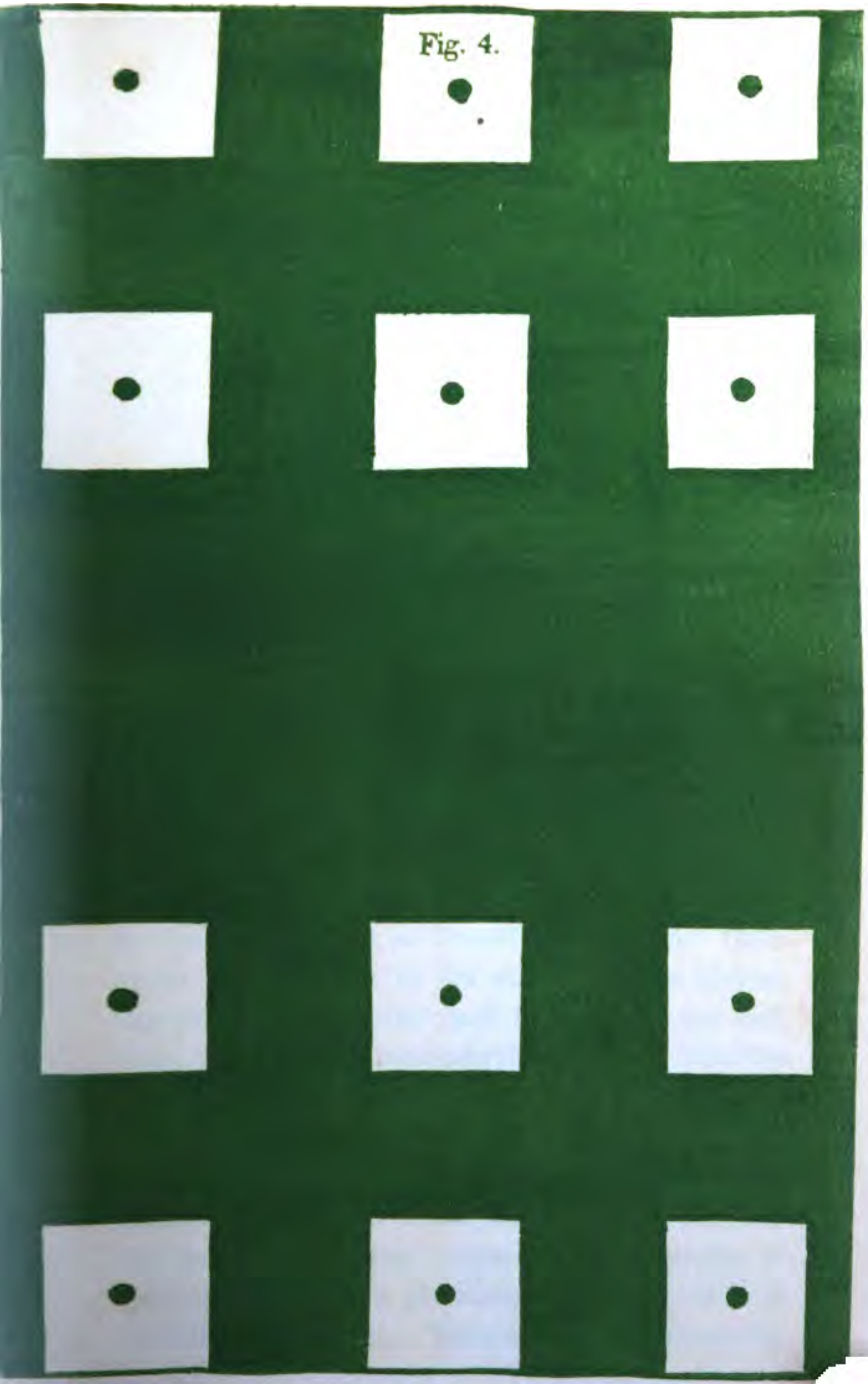


Fig. 2.

Fig. 3.

Fig. 4.



SECTION I.

MANURES.

Turf Ashes.—The most important of all human sciences is that of Agriculture, as all mankind must be supported by the produce of the earth. The art of tilling may, perhaps, be thought to have the highest claims on the attention of the farmer; but certainly manure must always exercise the highest elemental agency in rendering the soil productive; and of consequence, the procuring of manure in sufficient quantities to render even barren wastes productive, and to convert the wilderness itself into a fruitful field, must have an irresistable and equal claim upon the attention of the statesman, the philanthropist, the landowner, and the tiller of the soil. This gigantic and immeasurable object is what the author of the following suggestions contemplates, and which he himself believes may be thereby attained. He believes that sufficient manure may be obtained to make the earth yield all her increase, and he feels assured, that unless such a quantity of manure be supplied, the labour of tillage will be in part bestowed in vain. The pulverizing of the earth, and the supplying of a sufficient quantity of manure, are the two cardinal points in husbandry; and the system which he has now to recommend to the public, will supply those two great agencies in more abundance than any system heretofore adopted by mankind. By the adoption of the system which he is about to lay down, an inexhaustible supply of the cheapest and the best manure would be obtained, and one that would be more adapted to all soils and climates than any other now in use, namely, the manure of sheep, and which is the *next in quality* to that of ashes.

If to its intrinsic value, be added *treading* and lying upon the ground, it is more universally suited to all soils than any other of the animal manures. Turf ashes are however the *medium* through which this manure of sheep is to be obtained.

The lands more immediately alluded to are pasture lands which never have been tilled, as well as those which have been tilled and scourged, and deserted, in *ley** from five to ten years, when they have acquired some vegetable *matter, which may be converted into ashes, the most efficient* manure, especially in raising turnips; and as it may be satisfactory to inexperienced persons to know what other writers have said upon that subject, I shall in the following pages, quote the testimony of others, as well as state the result of my own experience. Paring and burning are not found to answer upon sandy soils, but on all others are beneficial, if the subsequent treatment of the soil be good; otherwise paring and burning will be found injurious.

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* Ley. Inferior soils which have been tilled and sown with clover and other artificial seeds and grasses, will throughout this work be considered in ley in the third and after years. A state in which there is some appearance of both artificial and natural grasses, but each so slight that it is difficult to say which prevails; therefore, neither the term seeds nor grass would convey the proper meaning.

"Ashes are such rich fertilizers, that the crops of turnips raised from them, are always great."—*Annals of Agriculture*, vol. i. p. 83. "Paring and burning, are practised by that enlightened agriculturist, Mr. Loveden, and the utmost success has attended it, in Windsor Great Park."—*Berkshire Report to the Board of Agriculture*, 534. In Oxfordshire, as well as many parts of the West of England, farmers pare and burn the *ley*, and even the stubble-land; they consider ONE ton of ashes from this source, worth FOUR *tons of farm yard dung*. See also Mr. Boys' opinion (Kent Report, to the Board of Agriculture), which is considered the best authority in the kingdom:—"Fine crops of turnips as ever grew in four months, after the spade was put in; no other manure than *ashes*, which are superior to any other manure."—*Report on the Bogs of Ireland.*

I have proved already the truth of the foregoing statement, by procuring PEAT from one part of Epping Forest, and SAND from another, *of the most sterile kinds*, and by transplanting Swedish turnips* in those soils, on July 6, 1837, and July 12, 1838. The growth of those in 1837, was prematurely checked nearly a month by mildew, yet those that had *ashes* alone, (4lbs. each,) weighed, on the average, 5lbs. 2oz. each, which amounts to 26 tons per acre, and those of 1838, though planted so late, were nearly as heavy; which is full 20 per cent. above the average crop of the country.

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* As transplanting the Swedish turnip is but little known in some parts, from many experiments I have made, I feel justified in stating, that it bears

Turnips, like many other vegetable, as well as animal productions, increase in weight most rapidly in the latter stages of their growth; so that I feel assured that those plants, which averaged only 5lbs. 2oz. each, from ashes only, would have averaged nearly 7lbs, if they had not been checked by the mildew. What weight they may acquire by the treatment here described in a favourable season, and when transplanted earlier, remains to be determined. In evidence of the quality of the soil, before alluded to, I may add, that those plants which had not the benefit of ashes, were smaller than a pigeon's egg.

It is well known, that two or three good crops of grain from sod *ashes* are raised upon very poor soils, and that such soils will soon be exhausted, that is, so soon as the vegetable matter and the turf ashes are exhausted, so as not to be worth tilling after-

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this operation as well as the cabbage. The process is cheaper than hoeing. Those persons who are not convinced of the fact, I strongly recommend to make experiments every season. When it is intended to transplant, the seed should be sown three weeks earlier than otherwise; the operation should take place when the plants are about six weeks old. The seed of mangel-wurzel may with great advantage be kept in moist sand or light earth within the house, until it vegetates, when it should be dibbled.

wards for many years. In Cornwall, this system is much practised, wherein some of the poorest of land, between the intervals of tilling, lies from seven to fourteen years in a nearly worthless condition.

This however is the case only with such as are out of the reach of improvement, by turnip husbandry, according to the present system; being too wet for the grazing of sheep in winter, and so unproductive in summer, while in old pasture, as not to be worth more than about 5s an acre; and when in ley about half this sum. It is therefore evident that poor soils not adapted to turnip husbandry, by the present system, are worth more by 5*l.* an acre, and in many cases twice that sum, *with the turf upon them, than without it.* It would cost 10*l.* in manure, to raise as good a crop of turnips upon land so exhausted as not to be worth tilling, as half the turf when reduced to ashes would produce; and it is quite notorious, that there is constantly a very large quantity of land in the kingdom in such a state. I say ten pounds an acre, because in addition to the value of the turf for ashes, it affords clean and *dry-lodging, which is the property* that has given such an increase of value to all the sand lands in the kingdom. As, therefore, soils which are sterile by nature, and not adapted to the growing of turnips on the old system, can be tilled, and under tillage will retain all their fertilizing properties, both those of their virginity, and those acquired by the use of ashes, by the system I propose, its superiority must be thereby clearly demonstrated. To the value of the turf for ashes, may be added that of pasture, which answers all the purposes of a natural bed or carpet. But there is a farther advantage in old pasture, when compared with land in tillage, in its being ready for immediate use.

There are many lands within a moderate distance of manures, as of bones and rape dust, which are light of carriage, and so very powerful in their effects as to produce good crops; but at the same time such manures are either too expensive in the first instance, or else require repeating before the outlay can be returned. Bone manure is the most efficient upon soils to which it is adapted; yet on inferior soils, on fallow in the ordinary way, or when seeds are sown with the grain, do not preserve the young grass from the reproachful term of *ley* beyond the second or third year. Besides if bones and rape-dust would repay the cost on every soil, a sufficient quantity could not be obtained. If, however, from the vegetable produced, or from any other cause, the *productive verdure were preserved*, the first outlay, even if it were greater than at present, would not prevent poor soils from being brought into cultivation.

The foregoing facts will serve to show the advantages of employing the turf and decayed vegetables for manure, and of maintaining and increasing the fertility of the land by the cultivation of the turnip and the feeding of sheep. According to Mr. Boys, and as we have already intimated, one fourth part of the turf, or the quantity already proposed, will yield four pounds of ashes. He says that "2,660 bushels are about the average produce of an acre, in the common mode of paring and burning, at 65 lbs per bushel, their weight when dry."—*Kent Report to the Board of Agriculture.* The foregoing estimate will give 77 tons (172,900 lbs.) per acre, amounting to within about half an ounce of 4 lbs. for every plant, when two feet apart, from which 30 tons of turnips per acre will be produced, on soils, which, without such a stimulant, would hardly support vegetation.

If one ton of ashes are equal to four of farm-yard dung, as previously stated, it is but fair to conclude that 4 lbs. per plant will answer quite as well as any larger quantity. Of this, however, I am not quite satisfied. As a ready mode of disposing of the ashes, a small scoop may be employed that would contain about 4 lbs., which a boy or girl might carry in one hand, with a basket of ashes in the other.

APPLICATION OF ASHES.—As different principles have been laid down upon this subject, it may be well to give the most important of them to the reader.

1st. Ashes are the most efficient when applied immediately after incineration.

2nd. When exposed for several weeks to the atmosphere, by spreading them over the whole surface, nutritious properties are acquired thereby.

3rd. Leave them in heaps as left in burning till the land be ploughed.

Ashes, like wholesome bread, may be used with almost equal effect, when either fresh or stale, though not with equal economy, and therefore a favourable opportunity of paring and burning, because the period of application may not be at hand, for in damp climates it will be desirable to secure a part of the stock of ashes in the autumn rather than place an absolute dependance on the spring. I know a recent instance of a large quantity of stale ashes being used with almost equal success to that of fresh ashes, although they had lain in a large heap for the space of four years.

In recommending the use of turf ashes, it may be observed that *they may be obtained on every acre on which cultivation has been stopped by sterility, which is the actual condition (including the ley) of nearly one-half of the land in the kingdom.* Poor pastures and waste land, for instance, which now let for from sevenpence to seven shillings an acre, realize at present but a very small proportion of what they would be made to yield, if adapted to turnip husbandry as practised upon sandy soils. As to their value in a state of nature, we need only to say, that from a statistical table published 1800, (*"Agricultural Table of Scotland"*) it would appear that there were *eleven Counties*, the rent of which did not average sevenpence an acre; and if the rent be higher now, it must be either because the stock has been greatly improved, or that a larger quantity of land is now in tillage.

This subject cannot be better understood, than by turning our attention to those dry soils, which are quite as barren in their native state, and yet which have been so greatly improved, merely because *that* has been done already upon them, *which will be done hereafter upon every other acre of poor land.* To comprehend the ultimate results of the system proposed upon such damp soils, compared with lighter soils in turnip husbandry, it will be well to bear in mind, that many of them are better adapted to the cultivation of the Swedish turnip than are the lighter soils: and also that the Swedish turnip is by far superior to the common sort, both as to quality in feeding cattle, and in resisting the frosts, as well as in their not being so liable to be destroyed by the fly, in the early stage of their growth.

But notwithstanding the inestimable value of turf ashes for manure, they have been hitherto rendered available only under very limited circumstances, namely, on those soils on which a system of culture can be pursued which will maintain their continued fertility. To pare and burn upon those soils, from which a few crops only can be reaped before they are again laid down to freshen, is a ruinous practice; and being once begun, the evil cannot be remedied within the life of the person who may fall into that error. Turf ashes, therefore, being the impetus, or elemental lever, and the first artificial power in the cultivation of waste lands, it must be certainly of great importance to keep up the fertility acquired, and which may be effected only by turning one fourth of the turf into ashes: whereas the renovation of such lands has been effected by the rest of centuries, or of thousands of years.

By the system here proposed, the fertility of such lands will be maintained and increased; and I am persuaded that from 50 to 100 per cent. above an average crop of turnips will be produced upon poor, but *fresh* soils. To fully prove this point, it is only needful to show the effect of consuming the turnips on the spot where they grew, which is done on all dry soils, and on the largest scale in Norfolk, "where rents have risen from eighteen-pence and two shillings to twenty shillings an acre; and by which means, a county of rabbits and sheep-walks, has been covered with some of the finest corn in the world." See *Norfolk Report to the Board of Agriculture*, page 3.

SHEEP MANURE.—Although I have estimated twenty tons of turnips an acre, I consider sixteen tons the average crop in Great Britain; and although the manure made by sheep when feeding on the spot is said to be worth *more* than £5 an acre, I will set it down at that sum. It will follow therefore, that the manure produced in consuming thirty tons is worth £7 10*s*. an acre. I will also suppose the virtue of the manures created in each year to be entirely spent in the three following crops, (one-third part in each year) which is not really the case; of consequence, the second crop would have a quantity of manure equal to £12 10*s*., and the after crops a quantity equal to £15. This, it must be borne in mind, is without allowing anything for the increase of the produce in consequence of this additional quantity of manure, and includes the winter food only; so that if a sum were to be allowed for the summer food in proportion to the stock the land will carry, it would, in the absence of proof, exceed belief. It may, however, be remarked that the *evanescent* properties of manures show the vast importance of a system which replaces them, as compared with that which produces the opposite effect, as is the case in raising grain.

Sheep manure is not a marketable commodity, as are bones and rape dust, but owes all its value to its power of producing vegetation on the spot where created: the quantity of meat and wool that such vegetation will produce, ought to be reckoned, so that the value of the manure in question may be ascertained thereby. Such an estimate of the ultimate value of sheep manure, will certainly convey to the farmer unpracticed in this department some idea of the REGENERATING POWER *which I propose to bring into active and* UNIVERSAL *operation.* Such a quantity of manure could not be obtained by any other means, not even for the choicest purposes, it being more than even the horticulturalist himself could afford to purchase.

Though practical farmers may possibly object to the sum of Five pounds an acre for manure made by sheep, while consuming twenty tons of turnips, according to the Edinburgh Quarterly Journal of Agriculture, yet few would doubt the effect that we say would be produced by such a quantity of manure when *yearly applied*, and a still smaller number would dispute the importance of ashes as a cause of vegetation, in bringing such waste lands into cultivation as are too wet for turnip husbandry upon the present plan.

But lest it should be thought I have attached too much importance to this kind of manure, when so applied, I will beg leave to call the public attention to the great expense and length of time required to bring poor, dry, sandy turnip soils as they are now called, into profitable cultivation, *by means of their own produce;* and also to compare the present mode of cultivating such poor soils, with what would be effected by the plan proposed, not only in relation to economy, but in relation to the efficacy of the agency proposed, and the *universality with which it may be applied.* There are, however, two points of difference between procuring ashes for this purpose on poor wet soils of which half the lands of Great Britain are composed, and that of obtaining them for the raising of grain. In the latter case exclusion of sheep, and exhaustion of the soil must follow; while in the former such consequences follow.

SECTION II.

TURNIPS.

Having shown that the most efficient, and the largest supply of manure can be obtained upon every acre of waste land, as well as on the poorest of that which is in cultivation, *(ley)*, it is only necessary now to show, that the next agent to be employed, will assist in keeping the land in a state of fertility. But before we enter into any statement of the quantity and value of the turnip crop, it will be well to give the reader a more detailed account of the mode of raising the turnip, and of the expenses and the profits of it; for upon these the merits of my system must ultimately rest.

As the success of the plan must depend entirely upon the raising of the turnip, the mangel-wurzel, and the cabbage, and fearing it may be thought that I have over-rated the produce, I will state what has been done by other persons in that way.

Pliny says, " I have seen one (a turnip) above 40 lbs. "In Berwickshire, as will be more fully seen hereafter, turnips have been grown of 32 lbs. each. Duhamael produced turnips of 20 lbs. each: and numerous instances can be produced of turnips 15lbs. each. Mr. Curwen " had on 40 acres, 40 tons an acre; and 99 acres at Neswick, near Driffield, produced 40 tons an acre."

With such ample proof of what may be accomplished, when manure is freely applied, it may be asked by persons not acquainted with the subject, and by those only, why such a quantity has not been always used? But such a supply of manure cannot be obtained by the present system of farming: and even by supplying such a quantity, more injury would be sustained by the following crops of grain than would be gained by the extra weight of turnips. Such a quantity of manure *alone*, on most occasions, would cause the grain to lodge. No argument therefore would be required to prove that the additional quantity of manure produced by sheep in such a case, would be injurious.

From a knowledge of the weight of crop produced by common means, and of what is done by the best of treatment, as just noticed, a correct opinion may be formed of what may be effected by the system here proposed, especially in situations that are not suited to the production of grain, as will hereafter be more fully explained. Other authorities might be adduced in great abundance; but two or three at present shall suffice, one of them coeval with the successful though not extensive cultivation of the turnip in this country, and the other, one of recent date.

Tull says, at page 88—"Turnips of 19lbs. weight I have several times heard of, and of 16lbs. weight often known, and 12lbs. may be reckoned the middle size of great turnips, and I see no *reason why every turnip should not arrive to the full bigness of its species, if it did not want part of its due nourishment.*" Note page 89, he says—"I have seen a whole waggon-load of turnips, spread on the ground, wherein I believe one could not have found one, that weighed *so little as* 6 *lbs.;* we weighed some of them that were 13, some 14lbs. each."

Tull began to drill in 1701, and died in 1740; which would be nearly 130 years ago. From the following observation made by him, we may infer that the cultivation of the turnip was but little known in his time; for in speaking of the great advantages of pulverization, he says, "The same effect follows when they prepare land for turnips, *since they are come in fashion,* and sow them several times upon several ploughings, the fly as often taking them off; they have from such extraordinary tillage a good crop of wheat, instead of the lost turnips, *without the help of dung;* hence double ploughing is now become frequent in this country."

Tull's success was not the result of *long experience* in this department, nor of improving the turnip by selecting the best of soils from which to raise the best kinds: and it may be asked, from whence did he procure the seed, and why was it not distributed throughout the country sooner; for it is well known, that the cultivation of the turnip was but little understood in most parts of England for even half a century after his time.

The following example is given, not because it contains the largest amount of produce, but because it contains such a remarkable coincidence as to quantity obtained by weighing, which is the only correct and satisfactory means. *The Edinburgh Farmers' Magazine* for 1814, p. 53, contains the following remarks on the produce of turnips. " A premium was adjudged to the white globe and red tops indiscriminately; the result, 9 cwt. 1 qr. 20 lbs. per fall, in all 75 tons 8cwt. 2qrs. 8lbs. the Scotch acre, or a fraction more than 60 tons the English acre, which bears to the English as five does to four, very nearly. It was the bulbs only that were weighed."

"About ten acres were of this sort, there were about three acres of Swedish turnips—the result of this was not laid before the Society, but it is entered in our books, as ascertained at the sight of a gentleman who inspected the whole, and it is this, 7 cwt. 1 qr. 4lbs. per fall, which comes to 58 tons 5cwt. 2 qrs. 24 lbs. the acre, (or 46 tons 7 cwts. 1 qr. 4 lbs. the English acre,) bulbs only, no leaves; and this I am confident is a better crop than the other, as 2lbs. of Swedish, I conceive to be equal to 3 lbs. of common turnip; the leaves in either case were not weighed, nor taken into account. But in the second highest lot that gained a premium, the turnips weighed, (the bulbs) 75 tons neat, the leaves were weighed also, and found to amount to 22 tons, or 97 tons in all, (nearly 78 tons the English acre.) It is to be remarked that the turnip is very little cultivated in this part of the country, (Ayrshire) some of those who gained premiums never before cultivated turnips."

Mr. Trinder, of Wantage, had in 1838—9, fifteen acres of Swedish turnips which averaged from 18 to 20lbs. The following results of the last season have been communicated in a letter from Mr. J. W. Baylie, near Monk Okehampton, Devon, to Mr. John Way, of Alphingham, from whom the seed was procured. Having spoken on the seed of the last year, he says,—"The turnips which I grew from it were some of the finest I ever saw. In one field of three acres, I had hundreds of turnips (I might say thousands) varying in weight from 20 to 26lbs. each, and in one small piece of vetch ground, wanting 20 yards of an acre, I calculate that I had at least 46 tons of turnips (white globe.) It is true I had bestowed extraordinary labour on the ground." *Exeter Flying Post.*

The foregoing statements, excepting the last two, have been given to show what may be done on poor land by persons who have not the benefit of previous experience. If therefore from 30 to 40 tons an acre can be raised by such means, and raised in large quantities, and 26 tons an acre, as in my own experience, from ashes alone upon a soil while in a state of nature nearly barren, I am satisfied that by the system here proposed a crop might be produced from year to year of 30 to 40 tons an acre. To accomplish this would only require each plant to weigh only rather more than those of the least of the large quantity mentioned by Tull.

Swedish turnips weighing from 12 to 20 lbs. and upwards are produced by the same persons, and exhibited from year to year at the Smithfield Cattle Show; which proves that the raising of turnips and mangel-wurzel* of that size, is not accidental, or owing to peculiar circumstances, but are produced by manures which every farmer may have at his command. *The quality of the soil in such cases, compared with the manure, is but a secondary matter.*

As this will be a public benefit, as well as a source of private advantage, it will be necessary to show, that the system proposed will apply to cultivation on the largest scale. The quantity of land being given, an outline of its capabilities will be easily made out; and the amount of population being known, the quantity of wool and butcher's meat that any given quantity of turnips will produce, will prove the truth of my system. But it will be impossible to separate the two subjects of turnips and sheep in such a manner as might otherwise have been desired.

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* Mr. Gibbs, Seedsman, Half-Moon Street, Piccadilly, exhibited mangel-wurzel this year, 1839, which weighed 40 lbs. each.

Having stated the quantity of turnips produced by means which every farmer will have at his command, it will not be unimportant to know the amount of stock which may be thereby supported. It is admitted on all hands, that all animals of the same species eat a quantity proportioned to their weight. It has been also said, that the average weight of a sheep in England is 20 lbs. a quarter; and that a sheep of such a weight eats twenty pounds of turnips in a day, gains a pound of flesh in a week, and about three-halfpennyworth of wool,—*6s. 3d.* per fleece. These statements will furnish data for ascertaining the value of the turnip crop as we have stated already.

If 140lbs. of turnips gain one pound of flesh per week, and be valued at threepence-halfpenny, and the wool three-halfpence making a total of fivepence; or at fourpence the flesh, and a penny the wool, it will follow that thirty tons of turnips will realize the sum of ten pounds, less by waste, say one-tenth. But to this must be added the value of the grass from three-fourths of the surface. Although I have alluded only to the turnip as winter food, yet a considerable quantity of leaves may be obtained in autumn, a period almost as critical with graziers as the spring. This observation in relation to the leaves will lead us to another which is so intimately connected with it, that the two subjects cannot well be separated, which is the eating of the grass between the turnips; and that lambs and young sheep will pick out weeds without touching the turnip is a well known fact, in confirmation of which I may appeal to Tull. He says—

"*Sheep* always refuse turnips at first, and unless they have eaten them whilst they were lambs, must be ready to starve before they will feed on them, though when they have tasted them they will be fatted by them, and I have seen lambs of three weeks old, scoop them prettily, when those of a year old, (which are called Tegs) have been ready to die with hunger *amongst them, and for* THREE OR FOUR DAYS *would not touch them ;* but at last eat them very well."—Page 90.—3rd Edition.

Before the sheep or the lambs are allowed to go among the turnips, the largest of the leaves may be stripped off, and that, if not with any advantage to the bulb, most certainly without injury. This practice will make room for the lambs, and will supply the rest of the holding stock with food.

Mr. Allen says, ("Colonies at Home,"* page 5,) that ten tons of leaves per acre may be taken off. I have cut off at the rate of twelve tons, although I lost one gathering through the effects of mildew.

As it may be desirable to improve other lands than those on which the turnip is cultivated, I would suggest the fencing off by hurdles or by nets, those stripes before alluded to, bringing in the sheep to consume the leaves, driving them back when their hunger has been satisfied, and fold them where their manure is required. By kind treatment and a little food occasionally presented by the hand to two or three in a flock, they may be enticed from place to place without any difficulty. For this purpose nothing can be more convenient to the farmer, and at the same time, beneficial to the *health* of sheep than salt. But this, like the turnip is *rejected when first* presented to them, but they soon become very fond of it.

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* The plan proposed by this worthy individual may now be carried into effect to a much greater extent, and with greater advantage than he ever contemplated.

Supposing that a field were not laid out in stripes, but in squares as shown in plate No. 1 yet a stripe of grass might be left for the purpose of feeding the sheep upon while consuming the leaves, at a distance of about fifty yards; so that persons stripping off the leaves would not have to walk more than twenty-five yards, and not so far with all his load. By commencing his gathering at the middle, and proceeding towards the sheep, he would arrive at the fold by the time he had gathered as much as he could carry. Making sheep the carriers of manure by this plan, would certainly be much better than the system now in practice, that is, depasturing them in the day on poor grass land, and folding them on fallows by night, and very often with a load not worth the carriage, in consequence of the scantiness of the pasture.

The mode of treatment in the beginning has been described already; and that of the second and following years being so much like that of the first, the repetition will be needless. It must be kept in mind, there will NOT BE ANY PARING AND BURNING, and the expense of pulverizing will be only very small, as the sheep themselves will do the principal part, and will render paring and burning, as a means of procuring manure, quite unnecessary; so that the expense in following years will be reduced to about one-third that of the first year.

This is in reference to *raising* a crop, that is, digging, pulverizing, returning the earth in the holes, transplanting and hoeing. Towards the spring of the year, care should be taken not to allow the earth to get too dry, especially on strong soils, before it be pulverized; it will frequently be in the best state at this season, when newly dug. Otherwise, the additional trouble and expense will be incurred of returning it into the holes, and again taking it out when rain may *happen*. Either this must be done, or a still greater loss sustained by damage done to the grass.

HOEING. After heavy rains, that would cause a clayey soil to pan, it may with great advantage be *stirred* (lightened), by striking the spade on one side of the hole, quite to the bottom, and pressing it lightly back, so as just to move all the earth in the hole.

Expenses after a crop is matured by this plan will be the same as by the present practice, namely, cost of hurdles and expense of removing, hacking up and slicing turnips, interest on capital employed, rent and taxes.

Although heavy clayey soils may cost 50 per cent. more at the first tilling than lighter soils, it is so obvious as not to require explanation, that this difference will not exist in the second and after years.

As it is quite impossible to say how many crops may be taken in succession without any additional expense in tilling fresh ground by taking a few inches in breadth from one side of each hole as stated at p. 11, it is equally impossible to say how much of the extra cost of the first year, compared with that of the following years, ought to be charged on the following crops, as is the practice in relation to fallows, judging however from the experiments I have made, I feel fully satisfied that the average expense from year to year, will not exceed two pounds; especially in mountainous districts where the raising of winter food for cattle will be almost as perpetual as that of the natural grass. But as the taking of so many crops of turnips in immediate succession, may not be deemed practicable, I will show that more are taken, under a less valuable system than the one proposed.

First.—In the present system, all the soil is tilled, and all is occupied by roots and fibres, that is, as far as any strong, cold, and imperfectly tilled soil can be so occupied.

Second.—In the proposed system of treatment, although *one-fourth* to *one-sixth* only of the soil be appropriated to the production of the turnip, there will be as much pasture, (as Tull would say,) for the plant as it required, and indeed more than is now commonly afforded on strong soils.

Third.—The plant will have a better supply of manure than the present mode of treatment can afford.

Fourth.—A soil which has been resting for the space of from three to ten years, freshening, with *annual refreshers of manure*, will be in a highly fertilized condition: and that will be the case by the treatment proposed, although a full crop of turnips or of mangel-wurzel should be raised every year; and although but a fourth part of the soil be tilled; for the fibres of the turnip will *not penetrate the untilled three-fourths* of the ground; and consequently cannot exhaust or tire that portion of the soil, but must be always in a fresh and vigorous condition.

One-fourth of the soil is appropriated to the growing of winter food, while three-fourths are continually acquiring vigour, and by a large quantity of manure in the consuming of the turnips, so that roots and fibres of grasses are produced in almost an equal quantity to those of rich pastures. The vegetable matter so produced will in due course become the food of the turnip in succeeding years; which in addition to the animal manure will enrich the soil to a degree never before contemplated upon an extensive scale; and therefore, the raising of three or four successive crops is really so far from being doubtful, that we are justified in saying, that successive crops may be UNCEASING.

On clay, and on stoney soils which are difficult of tillage, it will be desirable to raise the largest crop at the first digging; which may be done by pulverizing the ground in the most perfect manner possible, and by supplying as much manure as will produce a large bulb; both of which may be effected with advantage, because the quantity of ground to be manured and tilled is so very small; and therefore such a mode of treatment may be practised upon very barren soils.

By making holes two feet and six inches apart, instead of two feet only as before proposed, there will be nearly seven thousand plants on an acre, and one-third of the expense will be saved; this distance will be oftener adopted than that of two feet. At three feet apart,* there will be 4840 plants with a corresponding reduction of expense; an expense which will not exceed twenty shillings an acre whenever three or more successive crops are taken. By these means three or four times as much of winter as of summer food will be raised, and there will be a larger space for the sheep between the plants. These points may be easily proved; as land which will produce two tons of hay per acre is considered fruitful. Grass loses about three-fourths of its native weight by being made into hay; and land producing two tons of hay per acre is worth at least £3 an acre; and the expense of making the hay, and of serving it out to the cattle in winter, will be quite equal to that of raising a crop of turnips that would *fatten* three or four times as much stock as the hay would be able to keep only in good condition. Having ascertained the value of the hay, (and that of the land on which it grew,) by weighing the produce, let the same method be adopted in relation to the turnips.

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* The distance at which the turnip ought to be placed when the soil is tilled in the best possible manner, and as much manure supplied as will answer any useful purpose.

Instead, however, of supposing the land in question to be of the best description, and the turnip of the largest size, I will suppose the turnip to be a small one of the large sort, of six pounds only, "the least to be found in a waggon-load, while some would be thirteen, and others fourteen pounds."—see p. 29.

According to the first estimate there would be seven thousand plants per acre, and by supposing every plant to weigh six pounds there would be eighteen tons of produce, and from the second (4,840) or 12 tons. In the former case there would be more than four times the weight of turnips, to that of grass, and from the other, three. *To produce as much of* WINTER *food from a poor soil, as of* SUMMER *food from a rich soil, the plants may stand three feet apart, and weigh only 4lbs. each: the rent of the latter would be* £3, *and that of the former only* 3*s.;* and the expense of raising the turnips would be but little more, if more at all, than that of securing a crop of hay. Either of the latter cases would be found to be a much cheaper mode of improving inferior meadow land, than that of purchasing and carting dung: for supposing two fields to yield a load of hay per acre each, and one of them to be treated in the manner proposed for three successive years, and the produce consumed on the land by sheep; then mown for three successive years, while the other field is undergoing the same operation; and so on alternately, more, considerably more hay would be gathered from half, as from the previous whole. Although I have supposed each root to weigh only 6 lbs., I believe they will be nearer 12 than 6 lbs. On the last crop being taken, the tilled parts should be sown with hay and other seeds when the turnips are planted or hoed. The only objection that can be made to these statements is that of taking so many crops of turnips in succession, it may therefore be remarked that " Swedish turnips have grown on the *same* soil, on the property of W. Whitehouse, Esq. of Studley, for seven successive years, with *undiminished* fertility, and weight of crop. The soil consists principally of decomposing vegetable matter and chalk."—*London's Gardeners' Magazine, p.* 403. I do not recollect the vol.

" I see daily, grounds that have been planted with cabbages for a *score* of years at least, *and being often manured* they suffer no harm."—*Edinburgh Farmer's Magazine, vol.* 23, *p.* 407.

Numerous other proofs, if necessary, might be easily adduced; but that being unnecessary, I will conclude this part of my work by turning the attention of the reader to the regenerating principle of other vegetable productions. In forests a large quantity of rich manure is annually accumulated from the sheddings of the leaves, and fibrous matter, and decayed wood itself (the boil,) which produce a soil as rich as that of peat, and in the first crop more productive.* But the self-supporting, is more apparent in trees which support themselves, than in such productions as are assisted in the manner hereafter described: such, for instance, as the oak upon the lawn at Blenheim, which is said to have stood for six revolving centuries, and which has not received any nourishment from the decayed leaves since the mansion was built.

"The celebrated chesnut tree, the property of Lord Ducie, at Tortworth, in the County of Gloucester, is the oldest, if not the largest tree in England, having this year (1829) attained the age of 1029 years."—*Examiner*, 26*th July*, 1829.

Yew trees are supposed to attain the age of a thousand years before they have begun to decay within. I have seen one of them hollow to the extent of about eighteen inches in diameter to the whole length of the trunk or bole. It was about fourteen feet in girth. If it be therefore true, that the fibres, from whence the support is derived, die, and are annually re-produced, a vast quantity of the decayed matter of their own producing, must be absorbed in supporting the parent stock: so that before any objection can be made to the raising of successive crops of winter cattle food, it must be shown that the secreting property of the turnip must differ from that of almost every other vegetable. That there may be vegetable productions which cannot be re-produced on the same spot for a series of years is very probable, as in the case of the "skinless oat" and of Woad, I must allow; but that such is the case with the turnip, no one will be disposed to affirm.

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* Mr. Baring says, that "the land in Canada produces 35 bushels per acre, with the stumps upon the ground ten years after it is brought into cultivation."—*British Traveller*, 23*rd Feb.*, 1830.

That forest trees, and various sorts of grain have various effects upon the land, is better known, than the cause thereof is understood, we may allow; the ash, for instance, will impoverish the land exceedingly, although it does not become sickly by feeding on its own secretions: that the elm enriches land is proved by the produce when brought into tillage. Rye and barley are greater impoverishers than wheat and oats, except the sort just stated: but each of these, by superior tillage, and large supplies of manure, may be raised on the same spot for a number of years. Tull, who raised thirteen crops of wheat in succession by superior tillage alone, is a good authority in regard to grain. Whether he could have continued that practice until now, without applying manure, I am unable to say: but that with the aid of manure, he would have been able to do so, I am fully satisfied. I have been diffuse upon the subject of successive crops of turnips, because of the length of time it would require to put the matter to an actual test.

The case is widely different in relation to the subject next to be considered, that is, the space or quantity of earth which the plant will require for its nourishment can be ascertained in a few months; but that successive crops as here proposed may be produced, may not perhaps, be easily admitted. Every deficient crop, no matter from what cause, will be attributed to over-cropping. There will, however, be always one fact that will falsify the imputation, that is, a comparison with those crops which are raised on fallows in the ordinary way, with those on fresh soil on the plan proposed.

With the deduction in the expense already alluded to in the raising of winter food, and the increase in the produce of every succeeding crop, by the yearly application of from five to ten pounds worth of manure per acre, together with the increased quantity and improved quality of the three-fourths in grass, results will be produced as unprecedented in the annals of agriculture, as the results produced by steam, in manufactures and in navigation.

QUANTITY OF TILLED EARTH REQUIRED FOR EACH PLANT.

From the preceding observations, it would appear that *confining*, the fibres of the turnip to a small space is a matter of importance in this plan. All the surface soil having been tilled for this plant, has induced an *idea* that the whole of it is not only required, but that it is indispensable; and although it is erroneous, yet it will cause much prejudice; a prejudice which will only yield to occular demonstration. By showing that the system proposed, will accord with the best practice already in use in the growing of the turnip, it may serve, nevertheless, to soften the prejudices of those persons, who are most opposed to *innovation*, and induce them to have recourse to experiment.

Although sufficient space and quantity of soil has been already allowed, MORE MIGHT BE ALLOWED IF REQUIRED: and in regard to the leaves, we may observe, that the distance of two feet between the plants is not more space than is required in cases of high cultivation; not even sufficient when the soil is in the state previously stated and the plants three feet apart, and this I have stated, lest it should be thought I have adopted a convenient rather than a useful mode.

As to the quantity of tilled earth required for every plant, we may compare the system proposed with the present practice in relation to the ridge and drill, in which the turnips are placed from two and a half to three feet apart one way, and from twelve to eighteen inches the other. By the various operations of hoeing, whether manual or by horse power, these ridges are so nearly levelled, that a large portion of the fibres is either cut or broken off, especially in the last operation; and which is often done so late in the season, that the leaves then almost meet together.

If further evidence were necessary, as to the quantity of earth, and space for growth that evidence would be amply afforded by the horticulturalists. The large size to which the orange tree arrives in this country in pots and tubs, contains abundant proof. But, apart from all such comparison, I have proved that the turnip and mangel-wurzel will arrive at as large a size in a space of twelve inches square, by six* to eight deep, as in a larger space, or even when the whole of the ground is tilled. Indeed, it will be easily understood, that the more perfect the pulverization, the less will be the quantity of earth required.

Although the fibres do not extend so far in well-tilled and well-manured ground, as in a poor, coarse, and badly tilled soil, they are more numerous, so that almost every particle of the earth for about eight inches in circumference round the bulb and tap-root, to the depth of from five to six inches is always occupied; and consequently every particle of soil is made to answer all the purposes which nature has designed in promoting vegetation, so that when aided by manure, all that can be done is actually effected. But if the soil be badly tilled, and manure only sparingly applied, or scattered at random, as in the broad-cast system, roots will extend to a considerable distance on every side in search of sustenance, and when it is found, will form a bunch of fibres, even at a distance of two feet from the tap-root; and I have no hesitation in saying, that all strong soils, tilled by the plough, harrow, &c., are badly tilled, when compared with the spade, rake, and hoe, as here proposed.

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* I am aware that there is an exception to this on clay soils, in cold wet seasons; but this will in a great degree be obviated by a mode hereafter pointed out.

Three or four bunches of fibres may frequently be seen shooting out of one of these *running-roots:* while, on the other hand, when the soil is well pulverized, as are sandy soils by nature, and are plentifully supplied with manure, an horizontal, or running-root, is but seldom seen, and even then so small as to be more like a fibre than a root. If even the soil be well tilled, but no manure supplied, roots will strike out horizontally; so that in the absence of other evidence in relation to manure, the evidence before us is abundantly sufficient. Any one may satisfy himself on this point, by taking a plant from a poor and badly tilled soil, and by taking up another from a finely tilled soil which is well manured, and washing off the earth from both, and comparing them together.

In proportion to the fine or coarse state of the soil, and the presence or absence of manure, the running-roots prevail; which may be very properly considered as excrescence. Roots are a part of the bulb, and are fed by the same source, and fibres are the medium through which they are fed. This assertion has been well supported by Mr. Knight, the celebrated horticulturalist, who says, in treating of the shape and size of pots, "*the closer the roots are kept together the better.*" And as the space from plant to plant, of untilled ground, is not greater than in the drill system as just alluded to, *I claim nothing in the way of accommodation as a means of raising turnips, either for the roots and fibres, or the leaves, or for the resting and feeding of the sheep.*

To attain a correct knowledge of the subject in regard to the question before us, we must ascertain to what degree of fineness the earth may be pulverized, the space from plant to plant for the spreading of the leaves, the quantity of manure and of earth that the turnip requires for its roots and fibres; and for that purpose we may adopt the following means. Make a certain number of holes of different dimensions—say, from twelve to thirty-six inches square, then throw the earth which has been dug out into one heap, with an additional quantity equal to what will be left as refuse:—fill one set of holes with earth passed through sieves and riddles of different meshes, the widest of them being an inch square. That portion which is left in the sieve or riddle must not be returned to the heap, that it may pass through the next in size, nor should it be pulverized, or used as the finest animal or vegetable matter, would pass through on the first operation. There should also be sets of holes both without and with manure. The earth without manure should be placed in one heap, and that with manure be placed in another. If it be intended to use different manures, they should be mixed with the earth, and laid in heaps, before any portion of it be finally disposed of. And the quantity assigned to each hole should be weighed.

On the crop being arrived at maturity, it will be necessary to attend to the following directions:—

First.—As to the dimensions of the hole or tilled space at which the plant arrives at its full size, or rather as compared with plants produced, *where the whole surface has been tilled* to that extent beyond which the fibres should not extend.

Second.—Care must be taken that the earth be all of the same degree of fineness, and the quantity and kind of manure agree therewith. The produce from these experiments should also be compared with that of land tilled in the ordinary way, on which the same quantity of manure has been used. This I consider to be the only ADEQUATE TEST.

Third.—The produce should be weighed, or otherwise the experiment will be made to vary, according to the prejudices of the person who makes it.

Both gentlemen and tenants may satisfy themselves at a very small expense, inasmuch as lawns are never manured, and parks but seldom. While the tenant is at work upon his poor and enclosed pasture or waste land, the landlord may also be employed on soils unaided by manure. In trying it on lawns, care should be taken that it be made on a spot sufficiently capacious and free from shrubberies, to admit a free circulation of air, and so far from any wall that the reflection of the sun's rays may not produce a higher temperature than in an open field. Observations on climate best suited to the turnip, will render farther notice unnecessary.

All that is done should be committed to writing as the work proceeds. The most important experiments will relate to the *difference in the degrees of fineness to which the soil can be reduced by the two systems, together with their* RESPECTIVE RESULTS.

However desirous the landowner may be to satisfy himself on these points, with a view to the extending of the plan among his tenantry, the manufacturer, and the merchant, will be still more desirous of doing so, with a view to the lowering of the price of provisions ; and as a vast number of such persons have both pleasure grounds and parks, they may satisfy themselves by experiments how far my statements and the public reports are correct.

The most sterile soil, on which there is sufficient turf to produce ashes for the first crop of turnips, will be made from year to year, to produce from three to four times as much of animal flesh, wool, and tallow, as the best grazing land, will do, without expense in manure. Such land will of consequence be brought to a level in price, with rich soil ; this comparative value can, however, only be maintained so long as the rich soils continue in pasture. Lest it should be thought I consider that the grass of these poor soils possess all the fattening properties as that of a soil rich by nature, I beg to say that it will not; and as to grain still less so, and that it is beyond all art to make poor, soft, duffy, deaf, and sandy soil to produce half as much grain as a soil which is by nature rich, except by supplying a large quantity of clay or marle. In the absence of proof such statements may however be deemed as visionary; therefore I may refer to the treatment of Bruce, the well known traveller.

The following estimates may serve the purposes of rational conviction:—

Set the plants two feet apart, and there will be 10,890 plants per acre, which, at 3lbs. each, give 14½ tons and 26 stone; and which will support nine sheep of 20lbs. a quarter for twenty-six weeks, affording 140lbs., a week for every sheep; so that every additional pound in each plant, will together support three additional sheep for twenty-six weeks. In the following statement I shall omit the fractions of a ton, which will cause irregularity in the second column; but that, in effect, will be corrected by always adding the same number of sheep, preserving the same uniformity in the money column. These estimates apply to full grown sheep, allowance being made for waste.

lbs. per plant.	Tons per acre.	No. of sheep per acre, fed twenty-six weeks.	Produce at 5d. per week,		
			£	S	D
3	14	9	4	17	6
4	19	12	6	10	0
5	24	15	8	2	6
6	29	18	9	15	0
7	34	21	11	7	6
8	39	24	13	0	0
9	44	27	14	12	6
10	48	30	16	5	0
11	53	33	17	17	6
12	58	36	19	10	0
13	63	39	21	2	6
14	68	42	22	15	0

By deducting rent and expenses, both regular and incidental, a tolerably correct opinion may be formed thereby.

With the earth prepared, being pulverized in the manner I have described, and with the annual supplies of manure which will be made on the spot, it is but fair to conclude, that the produce will average fifty per cent. above what is at present realized. The improvements made by the Earl of Leicester are well known; and as they contain a fair specimen of what has been effected in the kingdom on dry soils, I shall take them as my guide.

Where profit is the immediate object of pursuit, too much evidence cannot be given; but sufficient evidence will, I hope, be found in the effects produced on all the turnip soils in our country. In attempting not only to equal a good system, but to exceed it, a man will have to contend with much popular prejudice; and yet I am convinced that the experience of a few years will be sufficient to produce a popular conviction. Had Lord Townshend at the commencement of his farming operations expressed his opinions on the subject of turnips, although he had deducted 50 per cent. from his estimate, he would have been considered an enthusiast. The best picture of the sterility of Rainham, in its original state, was given by a lady (Townshend), who said to Mrs. Coke, that when she first came to Rainham, she saw but one blade of grass, and that two rabbits were fighting for it. However severe the witticism may be thought, her words were nearer the truth than many are aware of, since a tenant gave up his farm, for which he had paid three shillings an acre, rather than pay an advance of only two shillings.

The Earl of Leicester's estate, it is said, now averages sixteen shillings an acre; but notwithstanding its fertility, he says, "the turnip forms his principal and most valuable crop." Sir Walter Scott, in speaking of Lord Townshend, *(Quarterly Review)*, says, "in something less than one hundred years, the agricultural practice which he introduced from Hanover, has spread itself throughout this country, and yields an annual return which probably exceeds the *interest* of the national debt." The editor of the *Quarterly Journal of Agriculture, vol.* 1, *p.* 392, in alluding to this subject, says, that "*the* *subsequent advantages derived from a crop of turnips must infinitely exceed its estimated value as fodder for cattle.*" The author of the Catechism on the Corn Laws says, that "Turnip Townshend was the greatest modern benefactor to the community," p. 5.

Although the correctness of these opinions on the great importance of the turnip has been universally admitted, yet every farmer has not had sufficient opportunity of making himself acquainted with all the benefits to be derived from it, by not being able to consume the turnip on the spot on which it grew. In such cases, opinions quite opposed to those laid down have been formed: but I am persuaded that the practice of a few years only on my plan, would prove them unjust; and this observation is supported not by my experience only, but likewise upon the fact that many farmers have asserted, *that turnips can no more be raised with a profit on land where they cannot be eaten off, than doing so can promote good husbandry.*

The County Surveys, supported as they were, by the sanction of the Directors of the Honourable the Board of Agriculture, will be certainly considered as sufficient evidence. Under the head of "Turnips," Mr. Kerr says, "an abundant supply of excellent succulent food for winter and spring use to sheep and cattle, as securing *subsequent fertility*, and augmenting the means of producing heavy crops of grain and hay, and excellent pasture lands; the turnip culture must be considered as the *mainstay of all good husbandry* ON SOILS TO WHICH IT IS ADAPTED."

In speaking of sheep and pasturage, Mr. K. says, p. 402:—"The numbers kept upon different spaces of land is extremely difficult to ascertain, for various reasons, and must vary indefinitely according to the quality of the soil and pasture, and the size and age of the sheep. An acre of *rich old pasture* is considered as equal to the full keep of *five* full-aged Leicester sheep, for the SIX SUMMER MONTHS." By referring to the table at p. 51, and to the quantity of turnips that may be produced per acre, (highly tilled and fertilized as the land will be,) it will be perceived, that five sheep per acre is only about one-third the number that will be kept by this plan for the same length of time. This opinion is fully supported without referring to unusually large crops. But by referring to extraordinary produce, and by taking *half* as a guide, enough will be shown to prove every statement I have made, of which the following is a proof.—It is reported in the *Liverpool Mercury, Nov.* 8, 1839, that "at Hallsall Agricultural Root Show—the first prize for Swedish turnips 23¾ lbs. was granted to Mr. William Skirving, Nursery and Seedsman, Queen Square, Liverpool.

"It is not uncommon to find turnips in drills on FRESH NEW LAND that will weigh from 20 to 32lbs. English; but a size under 10lbs.* is the most common. The rage for raising turnips in Berwickshire is so great as to induce the farmers to sow them sometimes on land so wet and spongy as not to bear the sheep's feet to eat, far less the cart wheels to carry them off. In this case, it is considered the best way to carry them off in creels (or large baskets fastened to a saddle) on horseback. The horse walks in the furrow between the rows of turnips without poaching the land."—*Edinburgh Farmer's Magazine, vol.* 5, *p.* 471.

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* An acre of turnips 10 lbs. each two feet apart will, according to the table at p. 51, feed thirty sheep twenty-six weeks.—Less the waste.

It is obvious that the advantages derived from the turnip, induce its cultivation on soils too wet and clayey to be properly fallowed. Such lands may *now* be *summer fallowed*, and turnips raised on seeds of the *first* or second year's growth. Consequently there will not hereafter be so large a quantity, if any, sown on what is improperly called fallow.

Many persons have brought severe reproach upon themselves in carrying the culture of this plant too far, by making bastard dirty fallows. Such for instance as must unavoidably be made on land requiring the use of panniers to carry off the produce. Turnips may now be raised with the young grass seeds, and such soils may be summer fallowed, and afford the farmer every opportunity he can desire of retrieving his character. But the most important consideration is that of dispensing with paring and burning the ley, as the manure which would otherwise be laid on fallow for turnips will be used on the *seeds* or ley. On ley but seldom, for it would be folly to allow the young grass to die for the want of the very food which can be supplied with a profit, by feeding off turnips raised upon them, should therefore any person still refuse to have old pastures disturbed and made rank by feeding stock on them, from four to forty times as much as heretofore, (which will be certainly the case in relation to the two extremes of pasture) the tenant *must* resort to his seeds or to his ley. On such occasions he will require farm-yard manure. For the purpose of conveying it upon the land after the holes are made as well as taking off the produce, a sledge will be more convenient than a cart.

The properties of the turnip in the feeding of sheep and cattle, have been long well known, nor should I have alluded to that subject here, but for a prevailing opinion that linseed cake is much superior; which opinion has recently been proved erroneous, especially in relation to profit, as will appear from the following report:—

"Transactions of the Highland Society of Scotland for June last (p. 61), containing a very minute account of a series of experiments in feeding cattle on different sorts of food, by Mr. Stephenson, who is a very extensive as well as an old and intelligent grazier:—The object of his experiments were *first*, to compare cattle fed partly on linseed cake, with those which had none; *secondly* to compare those fed partly on corn, with those which had none; and *thirdly*, to compare those fed *solely on turnips*, with those which had different sorts of food. Eighteen cattle were selected, which had all been kept in the same manner since they were calved, and were pretty much alike in condition, though varying considerably in live weight. Here it may be observed, in passing, that cattle generally consume food in proportion to their weights when nearly alike in condition; and this holds good not merely with regard to cattle of the same kind, but of different kinds. Thus: ten sheep of 14 lbs. a quarter, will eat nearly the same quantity of turnips as an ox of 40 stones. The cattle selected for Mr. Stephenson's experiment were oxen rising two years old, and bred on the same farm, their live weights being ascertained at the beginning, during different periods, and at the end of the experiment. They were divided into three lots of six beasts each, and placed in open courts, with sheds, and stalls, and mangers for corn and linseed cake. Lot I. were allowed linseed cake, bruised beans, and bruised oats, in addition to what turnips they could consume; and for the last twenty-four days of the experiment, 20 lbs. of potatoes per day were given to each beast. Lot II. received the same allowance, with the exception of linseed cake, and for the last twenty-four days 10 lbs. of potatoes each beast per day. Lot III. were fed on the common white globe turnips alone. None of the lots were allowed hay. The general result, after feeding 119 days, is as follows :—

	Increase of Value.			*Cost of Keep.*						
	£	*s.*	*d*	£	*s.*	*d.*		£	*s.*	*d.*
Lot I..	26	19	9¼	30	15	6	*Loss*	3	15	8¾
— II..	25	1	3½	23	2	0	*Profit*	1	19	3½
— III..	14	2	8½	11	11	7½	*Profit*	2	11	1

When turnips alone were used, a profit of twenty-two per cent. was realized; when corn was used with turnips, the profit was diminished to eight and half per cent. But when still more expensive food was used, namely, corn and linseed cake, with turnips and potatoes, a loss was sustained of no less than twelve three-tenths per cent. It is proper to add, that two pairs of the above cattle were selected and exhibited at the Cattle Show in Haddington, and gained the *first* prizes. One pair belonged to Lot I., and the other pair had one beast from Lot I., and the other from Lot II. They were sold on the ground for twenty pounds a piece."

We have here additional proof, that highly concentrated food is no better adapted to animals for profitable feeding, than to the working portion of mankind, or to the vegetable world, unless much care be taken in the application. But the same may be said of extremely poor food, however great the quantity employed. Potatoes, as already stated, will sustain human life; while heath, the produce of peat soils, straw* and grass of a very poor quality, will sustain animal life; but in all such cases there must be a fearful sacrifice of profit and of comfort. When highly concentrated food is injudiciously supplied to human beings or to cattle, its injurious effects are soon perceived; and the same remarks will apply to many vegetables. This is not, however, the peculiar property of bone; for there is no perceptible difference between thirty bushels and two hundred bushels an acre. To Mr. John Tallant, of Lincoln Heath, the world has been indebted for this great discovery; and indebted to Members of the Doncaster Agricultural Society, for ascertaining the fact that such manure *is not adapted to all soils.* But such discoveries can be appreciated only by such persons as have suffered by erroneous application.

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* Upwards of 20,000 head of cattle kept on *straw* during winter, in Dorsetshire (Report to the Board of Agriculture). In Scotland and Ireland a still greater number. Taking this as a guide for England,

It is also worthy of remark, that the fact of an acre of turnips fattening three times the number of sheep as an acre of grass, is not the only advantage attending the production of winter cattle food as here proposed, especially when we compare the present time with what was done some forty years ago: at that period, the common white *tender* turnip, was the only sort then cultivated, and being so liable to be destroyed by frost, its duration for the space of five months was not so certain as the Swede and mangel-wurzel now are for three-quarters of the

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there would be 2,000,000—say half this or 1,000,000. If not kept on straw they live principally on heath, which together with their being more exposed than in a straw yard, makes them worse. At a very moderate estimate, there are 4 millions of cattle in a state of starvation more than half the year.

year or even all the year round; consequently, the farmer was often left with his stock unprovided for by turnips in March and April, and sometimes in February, the very worst seasons of the year.

The Swedish turnip will keep until Midsummer; and mangel-wurzel till the following crop be fit for use. To accomplish this, mangel-wurzel and the *early* turnip may be raised together, one of the former at each corner of the tilled squares of twelve inches, and in the middle of those of two feet, which may be removed as wanted, in time to prevent injury to the young plants intended for winter use. To prevent damage, the leaves next the young plants may be stripped off: and by the time those thinnings are consumed the leaves of the main crop may be stripped off, which strippings will be continued till the bulb is fit for use, and by that means dispensing with grass. The common white turnip so far matures at an early period of the year as to weigh five pounds by the latter part of July, (which is more than the average produce of the country,) would show that this is not a very difficult task. These observations are designed to shew what may be done, and not what *will be required*, inasmuch as quite sufficient proof is given that there will be a plentiful supply of grass in the spring. They may serve to illustrate some very interesting matters which have been but slightly noticed hitherto.

First—That any given quantity of POOR LAND *may* *be made to fatten three to four times as much stock as the same quantity of the best grazing land would do.*

Second—That in saying poor land is worth more by £5 an acre with the turf upon it than without, we do not make any exaggerated statement.

Third — That the droppings of animal matter upon pasture, and the increase of vegetable matter thereby, do not while in a state of nature, produce any annual increase of value to the amount of one farthing an acre.

Fourth—That if the vegetable matter be worth £5 an acre, for the three-fold purpose of manure, grazing, and dry lodging, the land must have been from time immemorial in acquiring that value.

In stating that winter food may be raised upon ALL poor soils, it may be well to add, that clay soils are not so difficult to work with profit by the spade, as on a superficial view it might be thought to be; but I will endeavour to show that this is not so difficult a task as it might otherwise appear.

Such a conclusion can be drawn only from comparing the clay soils in tillage with those that will be tilled by the plan proposed. I admit that such a consequence would follow in the absence of all other applications, than those of the spade and plough, and the return of their only produce as manure; but not so with facilities afforded by my system. The first in rank, because the most efficient, and most prompt is always at hand, on the very spot on which it is required,—TURF ASHES.

This powerful stimulant, followed by the large quantity of manure made annually by sheep, will overcome this difficulty. To accomplish this object by these means, is a very different task from that of doing the same thing with the whole of the soil by the present practice. Tilling fresh land, although strong and heavy, is very different from that of tilling it when in an exhausted, tough, and birdlime condition. At the first tilling it is rendered comparatively light by the large quantity of roots and fibres, and will be still further improved in this respect by the extraordinary quantity of manure which will be CREATED ANNUALLY *upon it by the sheep, through the means of turnips*, while in the latter it not only loses that advantage, but is made SAD and TOUGH *by the tread of horses;* and the same effect is produced by the course of time, that the brickmaker produces in preparing his clay.

Notwithstanding the superiority of the spade and of manual labour over those of the plough, and that of animal power for the raising of winter cattle food by this plan, every opportunity will be seized by the farmer of adopting the latter, especially on the soils alluded to. I will therefore state under what circumstances it may be adopted to the greatest advantage. In fallowing and sowing down with seeds, or transplanting turf, or when tares are grown for summer food, as stated at page 13, either of the following modes may be adopted.

First, pare off about one half of the turf in stripes as shewn in the drawing No. 3, and lay the turf upon the unpared part until the newly pared portion be ploughed and harrowed, well broken — fallowed; and if done in the autumn, which is the best season for the purpose, especially on cold heavy soils, it may be laid up in one-bout ridges, as is done for potatoes. The sods may be returned to the tilled part, with the green side uppermost, to be preserved in the best condition till the spring of the year, when they may be reduced to ashes: at which time the tilled parts may be ploughed again, and harrowed and sown with the Swedish turnip, or with mangel-wurzel, or rather dibbled at such distances as such plants should be placed in the following years. These operations being completed, clover and other seeds may be sown, either at the time the turnip seed is sown, or in the autumn.

Mangel-wurzel seed being put into the ground in March or April, (which is the best season for sowing seeds) it may if desired be raised in preference to the turnip. When the new sward is sufficiently firm, the other portion may be treated as already stated, having taken turnips annually amongst the young seeds. The wettest pasture lands, with the aid of cotes or folds for avoiding the rot, may be drained, tilled, and fertilized to any degree that may be desired; and with this advantage, that there will be a profit from the first crop, although it should cost a hundred per cent. more than the after crops.

In the spring of the year, when the last dressings are given, should the tilled part not be sufficiently dry for the horses to walk upon, without poaching, a pole a little longer than the tilled part is broad, may be used, by which the horses may walk upon the untilled and *firmer* part, in the same manner that is resorted to, when harrowing in seed-wheat on wet soils in wet weather. The only additional trouble will be in removing the cock, or shackle, and that of one horse, and sometimes two, from one end of the pole to the other; and these last operations which are most important may be executed without horse or ox setting a foot upon the tilled soil. For this purpose may be used the *Revolving Harrow* which will be found more efficient than any now in use. See Appendix.

By this method of avoiding the tread of horses, another plan may be adopted, which in many cases will save the expense of underdraining.

Subsoil Ploughing.—By the present mode of employing this valuable implement, much of its advantages are lost, or counteracted by the tread of the horses when the land is wet: and although shifting the shackle and changing the position of a horse from one end to the other of the pole may be attended with some trouble, yet those inconveniences are more than counterbalanced by its advantages.

All soils which require this operation, should be laid out in lands or ridges not exceeding three yards and a half in breadth. This mode of using the subsoil plough may be adopted on wet soils tilled in the ordinary way, at the last ploughing of a *fallow*—the seed furrow, by the horses being kept in the open furrows on each side of the land. The lands or ridges should be formed, and laid at the desired elevation before these last operations are performed.

Tillage land, when treated in this manner, and sown with seeds, will be from two to five or more years, before they will be subject to the saddening tread of horses or of oxen, and consequently will have derived much benefit from the operation of this system; nor will the soil be so much saddened at *that period*, as if they had been trampled on when newly cultivated by the subsoil plough.

In returning to the subject under consideration, it may be observed that great as the advantages may be on tillage lands worked by horses, as a means of opening the subsoil, they will not be equal to those on lands tilled by the SPADE* in preparing only one-fourth of the soil for turnips: for it will be seen that on holes being made—all the earth being thrown out, the *subsoil* may be opened with a spade, so as to allow the surplus water to pass through with greater facility than when the work is done by the subsoil plough; as the soil may be *tilled deeper* than with the subsoil plough; and by being exposed to the action of the air and frost, the soil will be pulverized, and will be improved much more than can be done by any other means. A spade much longer and narrower than the common one should be used, from sixteen to eighteen inches long, four inches broad at the upper part, and between two and three inches at the bottom, and stronger than the common spade, the shaft being of the same length. The soil may be so stirred and lightened without taking it out of the hole as to allow the water to pass, with almost as much facility as if the ground had been trenched. But if the earth should be taken out for the purpose of being *improved by the action of the atmosphere*,* the surface soil should be placed in heaps, as stated at page 4, as a means of preventing mixture. But still no very great care will be required; and after two or three years of winter food have been consumed upon the surface, the whole of the subsoil first broken up, may be mixed with the surface soil.

For my own satisfaction, as to the practicability of raising turnips by this plan on a clay soil; having first proved it on a loomy sterile soil, a field was chosen, the subsoil of which, at the depth of nine inches from the surface, consists of three different sorts. The field is about seven acres, is nearly square, and forms an inclined plane. The upper part, at the depth before stated, is as perfect clay, as could probably be found in England; the bottom is a sandy loam, the middle gravel. The surface soil to the depth of from nine to twelve inches was removed to the extent of about a rood, on both the pervious and impervious soils; holes were made of different dimensions, and filled with earths of different kinds, with different sorts of manures, and the produce weighed. There was no difference worthy of notice in consequence of the *different kinds of soils in which the holes were made.* This shows clearly that the fibres, do not penetrate the untilled ground.

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* The air which encircles the earth is merely a decomposition of the material of the earth itself: the oxygen and the nitrogen exist in the soil, and the incessant action of different agents upon each other is everlastingly creating new separation of the elementary gases, which rise and unite in the firmament above: whilst on the other hand, the fixation of atmospheric air is incorporating the old atmosphere with the solid earth, and effecting new combinations over the whole terrestrial surface. Thus the earth and the air are mutually exchanging position and properties with each other; and all the analogies of Nature point out this plain and simple truth, that every element of Nature is connected with, related to, or dependent upon, every other element—that there is no such thing as the independent existence of parts, but perfect unity combines them all in one harmonious whole. —*Extract from the Shepherd, by the* Rev. J F. Smith.

As a given quantity of land will produce from three to four times the quantity of winter food, to that of summer food on pasture lands. I would recommend the fallowing as the best means of supplying that deficiency. Tares may be sown on lands intended for fallow, one half at Michaelmas, and the other in the latter end of May. This affords all the opportunity of fallowing that can be obtained in preparing for the Swedish turnip. The same purpose will be accomplished on wet tillage land which is now done on dry soils applied to turnip husbandry; and would consequently save the trouble of carrying off the produce in panniers. The raising of tares for soiling is not so much practised as it deserves, on *account of the small quantity of winter food compared with that of summer.*

In doing what has been proposed, on the subject of tares, there will be no obstruction, no interference with any routine of farming now in practice. There will be the same harmony, the same convenience as in raising winter food conjointly, side by side with summer food, turnips with grass, and dry lodging for the sheep.

Having said thus much on the subject of raising turnips by the plan proposed, it will not be out of place to state the expense of raising a crop by the present practice. Taking the following estimate as a guide (which I consider the best authority ever published) no fair comparison can be made.

Estimate of the First Year's Expense upon One Acre,—
Fallowed for Turnips.

	£	s.	d.
First ploughing at Michaelmas, one man 2*s.* 3*d.*, two horses at 3*s.* 3*d.*, including wear and tear	0	8	9
Stubbing and fencing	0	0	6
Second ploughing at Spring	0	8	0
Dragging twice over	0	4	0
Rolling, one man and three horses, ten acres per day, is, per acre	0	1	2
Harrowing, one man and four horses, twelve acres per day, is, per acre	0	1	3
Rolling and harrowing twice over	0	4	0
Carried forward	1	7	8

	£	s.	d.
Brought forward	1	7	8
Dressing and burning couch	0	1	6
Third ploughing	0	7	6
Dragging once over	0	1	6
Rolling and harrowing twice over	0	3	6
Dressing and burning couch	0	1	6
Fourth ploughing, five roods per day	0	7	0
Harrowing and rolling	0	4	0
Dressing and burning couch, and gathering stones	0	1	0
Ploughing, seed, furrow, and sowing	0	7	6
Five dressings 5)	3	2	8
Average for each dressing	0	12	6
Ten loads of manure, at 10*s.* per load	5	0	0
Turnip seed, two pounds at 1*s.* per pound	0	2	0
Hoeing twice over	0	10	6
Suppose three chaldrons lime are applied every third fallow, therefore say one chaldron	0	9	0
Leading ten miles, at 9*d.* per mile	0	7	6
Watering and spreading	0	2	6
	£9	14	2

Bayldon on Valuing Rents and Tillages.

SECTION III.

SHEEP.

By the preceding observations I have shown that a plentiful supply of the richest manure for the first crop, even on the poorest soils, and situated, as most of them are, in the most ungenial climate of our country, can be always procured; and that the second crop will possess the important properties which are necessary not only for creating others of the like amount, but for increasing them till they arrive at as high a state of fertility as is required. This object will be gained, not by a slow and expensive process, the benefits of which by the present system may be entirely lost in a few years, but by a process that will render them permanent and secure. Nearly one-half of the kingdom is at present in this unproductive state. Some idea therefore may be formed of the importance of the agents by which all the proposed improvements are to be effected. Turnips are as necessary to the support of sheep, as sheep necessary to the support of mankind; and as one-half of the butchers meat now used, and the largest portion of our clothing are derived from sheep, some idea may be formed of the important station which the sheep must occupy in relation to our comfort and support.

I have estimated the gross amount of beef and mutton as being equal; but if the superiority of the sheep, as an improver of the soil, be taken into my account, it will appear that I have under-rated the importance of the sheep. At present no such comparison, as to the relative value of cattle and sheep in the gross could possibly be made: for although enough has been said already to show the immense value of sheep, yet a slight view of what has been done by means of that creature since the introduction of turnip husbandry, will serve to show what may hereafter be accomplished.

That those lands which have been hitherto improved by means of sheep had been more sterile than those which yet remain to be improved, and that the means employed already are much slower in their operation, and less profitable, than by the means proposed, must be sufficiently apparent. Soils which are now in a state of waste, will always produce more vegetable matter than will sandy soils; and therefore sandy soils have not been selected for cultivation because they were really better in quality than those that were rejected; but because they afforded the only available means of accomplishing the purpose desired; which was dry lodging for the sheep in winter; and because under that system the turnip could be cultivated on such lands, and on no other with advantage.

As the proposed plan of grazing is not adapted to the rearing of cattle by the present system, the system proposed may be thought to be liable to reduce the quantity of beef below the amount demanded; I will endeavour to show that an equal stock of beeves to that of sheep, may be still supported, even though there should not be an acre of RICH OLD GRASS LAND APPROPRIATED TO THE FEEDING OF CATTLE.

Supposing the average produce of turnips now raised to be twenty tons upon an acre, a quantity equal to Five Pounds in value, and that in feeding upon them, there should be more than Five Pounds worth of manure made by the sheep, it will follow, that if thirty tons were produced on an acre, which will be certainly the case upon the plan proposed, as much beef as mutton may be produced, by carrying one-half of the crop to the homestead, and that there would still be a sufficient quantity of manure left upon the ground for the next crop of turnips. For who ever heard of a quantity of manure equal to Five Pounds in value being supplied yearly by the land itself or by purchase? Had I not carefully observed the manure made by cattle, I should have spoken with less confidence; but I know it to be little when compared with that of sheep, unless they feed on linseed cake or corn, and unaided or unmixed with other substances, and applied as in the case of sheep must be comparatively valueless.

Mr. Curwen says:—

"In this dilemma, my intelligent and indefatigable manager, William Glover, suggested the idea of breeding cattle on the soiling system; and the experience of many cows having stood the confinement for eight years, without suffering in constitution, encouraged the attempt; whilst the last sale of cattle from the sheds has justified the measure, and confirmed its beneficial results, by stamping it with the public opinion, which on that occasion was pronounced on the system. The size and symmetry to which cattle may be brought by their being kept constantly progressive in their growth and improvement, without receiving any check whatever, seems to warrant an assumption, *that such stock will surpass those exposed to the vicissitudes of climate, all the changes of weather, and other inconveniences inseparable from the grazing system, though fed on fields of the richest and most luxuriant herbage.*

"That the soiling system is attended with great labour in cutting and collecting the food—in feeding and keeping the cattle clean, cannot be denied. But what are the attendant advantages? *Amongst many the same number of acres are found to be capable of sustaining double the number of stock*—very inferior food may be made available—all waste prevented—the health of the animals preserved, and accidents precluded. In short, where grazing land is worth forty shillings an acre, I dare pronounce the soiling of cattle to be the most beneficial application of its produce to the farmer. On very thin-skinned and poor soils, or those of high elevation, grazing by sheep, is perhaps the only possible use to which such lands can, by the husbandman, be profitably applied. Soiling has afforded an opportunity of using all the grass grown in the plantations, which in the last year furnished *early* food for six weeks, during which time, not half a dozen acres of the first crop of clover were cut for soiling. The consumption of turnips hitherto, has been prodigious, probably from eight to ten stone a head for the food of one hundred beasts per day, given with nearly a stone per day of chaff, i. e. the husks of grain steamed, and some straw. Hay has never been given to the cattle, excepting when a beast has been ill; the whole of which, in the course of this or any previous year, has never occasioned the consumption of one ton; nor have they had either corn or oil-cake.

"The great desiderata in soiling, is to give food often, and in small quantities; to attend to the manner in which it is eaten by the cattle; to reduce the quantity of food on the slightest symptom of loss of appetite; to be cautious that clover is given sparingly, especially when it is wet, for the first feed; to prevent the cattle becoming hoven.

"The whole of the turnip crop is gathered, stacked in the field, and taken home at convenient opportunities, when food is required. YET THE DETAIL AND LABOUR OF DRAWING GREEN CROPS TO ANY DISTANT ESTABLISHMENT, AND AFTERWARDS CARTING BACK

THE MANURE, ARE ATTENDED WITH GREAT INCONVENIENCE AND RUINOUS EXPENSES. THESE EVILS POINT OUT THE NECESSITY OF HAVING CATTLE SHEDS DISPERSED OVER EVERY PART OF AN EXTENSIVE FARM. The more distant parts of mine, constituting a moiety of the whole, I am cultivating on an altered system, by appropriating the manure to those parts within a reasonable distance of the premises at the Schoose, and dressing the more remote parts with lime, rapecake dust, and ashes procured from clay, burnt on the spot. *The turnips, under this new arrangement, will be fed off by sheep, on the clover leys, which, will afford an opportunity of giving a greater quantity of dung to the clayey soils; and as far as the trial has proceeded, I am encouraged to believe it may be practicable, as weighty crops of turnips are capable of being procured from a dressing of clay ashes; and if a part only can be eaten off by sheep on the ground, oats and clover in succession would probably succeed; the land to be afterwards exclusively grazed by sheep.*"

Should it be asked what is to be done with such large flocks of sheep, under a failure of the turnip crop, the remedy is obvious. Keep a good stock of hay between the rows of turnips, as is shown in fig. 2. Even such land on which two rabbits fought for a single blade of grass, would soon supply hay upon the system here proposed. On the moors in the north of England, and in the Highlands of

Scotland, there is as much difficulty in preparing and securing hay as there is in raising the grass; whereas by the plan here proposed, with the aid of Dr. Richardson's discovery, stock masters would completely overcome that difficulty. Let the reader peruse the Doctor's "Farewell Speech," or else read my abstract of it in the appendix.

From the Doctor's own statement it appears that "this valuable grass has failed in mountain districts in particular, from a want of *frequent* top dressing." Such top dressings may now be supplied much oftener and in greater quantities than he could ever have contemplated.

But fiorin grass unaided by frequent top dressings, only shared the same fate as all artificial grasses must do under the same treatment, excepting on the best lands. I would only ask, what sort of land it is on which grasses will not thrive when supplied with from five to ten pounds worth of manure per acre EVERY YEAR? It is the peculiar property of this grass to retain its nutritive properties, in spite of the withering and destructive power of wind and rain and sun, in quick succession, so destructive to other grasses in the process of being made into hay, which will always give a value to fiorin grass, that can hardly be over-rated by stock masters of high lying peat soils, *now that* TOP DRESSINGS *by this plan can be so easily supplied.*

Of the grasses which are generally cultivated, a sufficient quantity will be raised in dry situations, to answer the purposes which fiorin will be made to answer in damp situations, so that no inconvenience will be felt when the turnips happen to be deficient. It may however be remarked, that the turnip crop is not so liable to fail in a damp climate as it is in the south of England. These observations therefore will chiefly apply to Scotland, and the moors and mountains of the north and west of England: for in almost every other part of Great Britain, grass may be mown in time for the transplanting of the Swedish turnip. It will not therefore be necessary to adopt the plan at figure 4.

While on the subject of improving pastures, I will just notice the diversity which prevails on this subject, in the practice of persons having the same means. In some cases, their sheep are folded at night; in other parts, they are kept together both day and night by hurdling off as much fresh pasture every day as the flock can eat; while in other parts they are not folded at all. But notwithstanding this difference of treatment, the advantages of folding are almost universally admitted. And in proof that poor pasture lands are *not improved by sheep,* where they are *not folded,* it is only necessary to take a view of those lands on which folding has not been practiced. But supposing the improvements by grazing on poor pasture lands to be one farthing an acre per annum for the last century, it would be little more than they now let for annually. And this would suppose that the lands had no herbage upon them at the commencement of that period; whereas they had just as much at that time as at present, which clearly shows, that the annual improvement by the droppings of animal matter cannot be estimated at any sum for which we have any coin, not even from century to century, and much less from year to year.

Although no value has been given to those soils by grazing, there is an acquired value from another source; which is the vegetable matter, now worth about two shillings an acre per annum to the sheep breeder; which by the aid of the system proposed, will render the vegetable matter, now worth about two shillings, to be worth *two pounds an acre*; *and will continue to do so, as long as an acre of rich pasture land continues to be worth that sum.* At all events, such lands would be made to yield twenty times their present amount of produce.

This unproductive state of so large amount of pasture, together with the absolute impossibility which now exists, of profitably improving grass lands even of a better quality, would show, that the advocates of free trade, in asserting that "Great Britain ought to be exclusively a grazing country," little thought, that *if such a measure* were to be adopted, they would not be supplied with more than about one half of the quantity of animal food that would be required, supposing it to be half a pound to each person daily, nor that they would be obliged to use this scanty supply *in a salted state, nine months in the year*, as previously to the cultivation of the turnip, together with the evils arising out of such a system, especially the scurvy and drunkenness. It is therefore clear, that this would have happened, if there were not any tilled land on which to raise cattle food for winter, as was the case, when there was abundance of land in tillage, but no known vegetable to cultivate that would answer such a purpose.

Indeed, it would be now, as it was then, cattle would gain flesh in summer, and lose it in winter, almost as quickly as the forest trees lose their leaves, leaving the bones almost as much exposed to the winter blast as the branches of the leafless tree. It would be, as it has been before, what a mercantile man would call a periodical transaction of loss and gain: the merchant is dependant upon the *uncertainty* of the winds and the waves only, but this is certain loss of flesh without the interposition of either winds or waves: it would be all loss to the community at large.

In proof that this is not an overstrained representation, I will show the full amount of animal food that could be brought into the market yearly, *if every acre in the kingdom were in pasture when unaided by art.*

I will suppose that there would be six millions of acres of rich grazing land, that would support five sheep per acre for the year round, (I am aware this estimate is much too high) thirty millions of sheep, and the land let at three pounds an acre ; and I will suppose the rest of the cultivated lands to amount to forty millions, and to let at one pound an acre, carrying a number in proportion to the rest. Sixty-seven millions of sheep ; and the thirty millions of waste land to require two acres to support one sheep — fifteen millions. These estimates would show, that the whole stock supported would amount only to one hundred and twelve millions, not quite one and a half per acre, composed only of *skin and bone*, for eight or nine months in the year, with some flesh during three or four months only. With such keep, the annual disposable stock would not exceed one quarter of the whole. From these estimates, must be deducted as much pasturage as would support a number of horses and cows, equal to fourteen millions of sheep, or more : and this would prove, that there would not be *a quarter of a pound of animal food per day for each person.* It is not probable that grain would be imported to feed pigs ; for there would then be quite enough to do to feed the human race.

But if only the poor land in the United Kingdom were cultivated, as stated in the foregoing pages, it would not only support but fatten more, far more sheep per acre than the best grazing lands, and *instead of having salt meat and salt butter nine months* *in the year, there would be none at all required*, except to stimulate the appetite. THIS MIGHT ALL BE EFFECTED FROM THE LAND NOW LYING IN WASTE, and consequently *all* the forty-six millions now in cultivation might be appropriated to the cultivation of grain, hemp, flax, and beet-root for sugar: that is, none of it need be in *permanent* pasture.*

But the most probable, although not the wisest measure to be taken, is that every store-master will set his own *manure manufacturers*† to work on his own land, leaving those who have none to look on. I mean to say, that the occupiers of rich pasture lands would do well to sell part of their stock upon the first advance in price, and to convert their lands into tillage: for it will be seen, that in addition to the quantity of stock which poor lands will be made to carry more than the rich, the FATTENING PROPERTIES of the produce of the former will continue nine months in the year, and that in greater perfection than the latter will retain their's for half that time. It is, therefore, the weight of flesh and wool, which each sheep will gain from the produce of poor land as compared with that from rich land, which must be taken into account, as well as the *superior number* of sheep which the poor land will carry.

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* It must needs be borne in mind, that if every one were supplied with a sufficient quantity of meat, less bread would then be used.

† My authorities for treating farming as a trade and manufacture, are such as the following:—

"That the cultivation of the soil of a country is a trade and manufacture, and is so far the most important trade and manufacture in every country, as every other trade and manufacture must depend upon it.

"That though the production of corn for the food of man is in Great Britain one of the most important objects of cultivation, yet the means of obtaining the production of corn, the quantity purchased, and the profit to be derived by the cultivator from the production, are all dependent on many other objects of production, and especially on the production of animals and of food for animals."—LORD REDESDALE.

From the brief sketch already given, it will have been perceived, that the stock of sheep thus far kept has tended greatly to improve the agriculture of Great Britain, *since the introduction of turnip grazing*, as well as to improve the riches and the comforts of the community at large. I will therefore endeavour to show how those riches and comforts may be still increased, by taking the data from the stock now in hand; and as it will promote the interests of the farmer and the land-owner of poor soils, to increase their stock, it is but fair to expect they will do so; and therefore I will venture to predict that they who do so first will be the greatest gainers.

Although no reliance, as Mr. McCullock very justly says, can be placed on statements respecting the numbers of sheep, they are nearly enough estimated to ground other estimates upon them. Mr. Colquhoun estimated the number of sheep and lambs in Great Britain and Ireland at 42 millions, and this he did twenty-five years ago. Since that time the sheep have been estimated by Mr. McCullock at thirty two millions.—*Commercial Dictionary*, vol. 1, p. 234.

This estimate however, is accompanied by this very just remark that, " owing to the very little attention that has been paid to such subjects in this country, where every sort of statistical knowledge is at the very lowest ebb; there are no means of arriving at any conclusion which may be depended upon."

Supposing Mr. Colquhoun's estimate to have been correct at the time it was made, Mr. McCullock's also may be right in regard to the number of sheep; for in the very year in which his work was published, the rot was producing the most destructive consequences among sheep. If, therefore, the eight millions of sheep said to have died in England and Wales from that disease, be taken into the account, with the additional quantity of meat required by the increase of our population, which is said to be 300,000 a year, we shall rather feel surprised at having so many as thirty-two millions, than at our not having more.

It appears from the number of sheep and oxen sold at Smithfield, that the weight of butcher's meat obtained from the two species is of nearly equal amount; the whole stock may be therefore estimated at sixty-four millions of sheep. This may be taken as a guide for the kingdom, and will be so regarded in the following remarks.

As another mode of abbreviation, I will suppose one half of the stock to consist of ewes and hogs, that is, lambs from eight to twelve months old, to be supplied with ten pounds of turnips each per day, and the wethers and fatting ewes with twenty pounds a day. The wether hogs may consume more than ten pounds a day, but the gimmers, and the breeding ewes will not, in addition to the grass, require so much : so that I apprehend this estimate will be sufficiently correct as a ground work on which to ascertain the number of acres that would supply the stock. At the same time, it will be admitted, that the holding stock of both kinds, on the present system, cannot be supplied with more than *half the quantity of food they ought to have, or which they might have to advantage.*

If the wethers are kept till they are three years old, which will not often be the case, they will be fed about eighteen months, or three winters on turnips. They will be ready for the butcher at two years, or two and a half: it will be therefore matter of calculation in relation to profit, whether they should be sold at two or three years old. If kept till three years old, the breeding stock will be reduced below that which has been stated in another place.

Supposing an acre to produce thirty tons of turnips, to supply sixty-four millions of sheep would require the cultivation of 2,560,000 acres. But supposing the fourth part of the stock, or 16 millions of sheep to be fed by the turnips, according to the present rate of produce, say twenty tons an acre, it would be necessary to cultivate for this supply at twelve sheep per acre, 1,330,000 acres. Part of this amount should be deducted from the foregoing estimate of 2,560,000 acres, because the occupiers of dry soils will continue their practice; so that making no allowance on that account, the additional quantity to be brought into cultivation would be about 1,230,000 acres for the stock now in hand.

As to the quantity of food here supposed to be supplied, it matters not whether it be too little or too much, for it can as easily be varied, as it is now dispensed with, and that with a deal more comfort to the stock, and with more profit to the owner. It is however a quantity that will keep up their condition during the six months of winter.

To cover this expense of the holding stock, every sheep must be worth more at Lady-day by 3s. 3d. than it would have been if kept as sheep now are. This is according to the *cost of raising the* FIRST CROP: *for in after years about* ONE HALF *this sum only will be required—say two shillings.* By taking a view of the lost flesh, loss in the weight of wool, deterioration of wool, loss of time in the *months of* SPRING *in recovering from their stunted and murrain-like condition*, it will require no great skill to perceive that there will be a profit in the proposed system, to which may be added, the augmented value of the summer pasture. The proposition asserts a fact, that stock reduced to the state to which it is commonly reduced in winter, and more especially on heaths and moors, *requires the best part of the season to recover from the effects of starvation.*

The annual loss from death, the celebrated James Hogg, the Ettrick shepherd, estimated for Scotland, seven and a half per cent., upon the whole stock, two-thirds of which resulted from the *want of food and shelter*. Whether that talented individual understood that subject better than others, we shall not stay to determine. Suffice it to say, that he possessed the rare qualification of communicating his thoughts to others, in a manner that awakens the best sympathies of our nature, and that not merely in stock masters and shepherds, and in such persons as are immediately interested in rural affairs, but in mankind at large.

When the advantages of guarding against such calamities come to be summed up, it will not require any stretch of fancy to perceive that *there will be a certain saving of cent. per cent. upon the outlay*, to which something may be added on the score of compassion towards the animal, by the most needy of mankind; as well as on the score of improvement on the outcast lands; and not a little in relation to poors' rates, which will certainly augment the profit both to the owner and the occupier of such soils.

It will be easily perceived from the preceding pages, that if Lord Redesdale's definition (p. 82) be a just one, the manufactory put into active operation by this plan will be productive of no ordinary effect. In living creatures it will far exceed in number all the manufacturing population of Europe. To form an adequate conception of the magnitude of the object under contemplation, we must take a view of the various persons that will be then employed in the making of implements of agriculture, in the extensive and numerous operations that will be required in preparing the soil to receive the seed, and in manufacturing furniture and clothes for the working people; and of the still more extensive, although silent operations of nature, in her bringing to perfection what has been committed to her care, and which has been so greatly aided by art. And again, the various and the all-important purposes to which this artificial produce is appropriated; the support of animal existence on which mankind depends. In relation to Great Britain, only one half of the land can now be operated upon by any known mode of cultivation. If the other moiety can only be made to answer the purposes designed in the system proposed, the mightiest effects must be produced thereby.

THE QUANTITY OF LAND WHICH A MAN AND HIS FAMILY MAY TILL, AND THE MODE OF CULTIVATING IT POINTED OUT.

Thus far, the subject will be easily understood by the working farmer, but not by the artizan and mechanic; and therefore a sketch of what may be effected by those classes, with the aid of their families, will be of service to them, inasmuch as it will show what an individual may do by this plan, when his labour is superseded in the manufacturing department by machinery, or reduced in value by an increase of population beyond the demand for labour from the sources heretofore known.

I will at the same time, give a sketch of the capability of the working classes as a body, not only physically, but in a pecuniary point of view.

And, first of all, their pecuniary means as a body. The statistical information supplied by the Savings' Banks, dispels the mist in which the subject would otherwise have been enveloped, and therefore I am willing to hope that it will now be rendered intelligible and cheering. Great as the sum deposited in Saving's Banks may be, it is but the earnest of a larger treasure, possessed and applied by the higher classes of mechanics and servants in their different stations. The information thus obtained is not only sufficient to show, that with this sum at their command, they may not only correct many of the evils which arise out of the want of employment, but may command a better remuneration for their services when so employed. To have asserted without authority, that the working classes could raise £20,000,000, would have been considered as extravagant; and when so asserted in support of this argument, a much more unfavourable conclusion would have been drawn. I have mentioned these classes in preference to others, as possessing the means of purchasing land, and of employing those persons who have only their own industry to depend upon, for the following reasons.

First.—Because there is a more immediate and a more friendly intercourse among them, than among any other classes of society.

Secondly.—Because their interests are more nearly allied, and there are no dissensions in consequence of one interfering with the trade of another.

Thirdly.—Because the small sums of three or four hundred pounds will be sufficient to locate a family, by purchasing poor land, stock, and implements, and building a cottage, and affording support for one year.

And as to the capability of the *operatives*, there are sufficient data to show, that the labouring classes have never failed to accomplish all that could be reasonably expected under ordinary circumstances, when employed in cultivating the soil exclusively by manual labour: and while this would show talent and industry on the part of the operator, it would equally show the soundness of the system of spade husbandry.

What then may not be accomplished by the same agency under the system here proposed by which a full crop will be raised by tilling only one-fourth of the soil at a time, and by which the whole surface will be continually increasing in fertility and value? These circumstances, together with the fact, that the tilling and cropping of the whole soil, according to the present practice, will render the soil more sterile, while no more manure is returned than is made from the produce, are themselves a sufficient guarantee of success: and more especially, while accomplishing these purposes, the persons so employed will be raising the most profitable produce—butcher's meat and wool.

In addition to these advantages, we may add, that of constant employment for a man, as well as for every member of his family, in every season of the year, which is an advantage that the present system cannot afford.

But, what is still more important to the working man, is the fact, that his labour will be far more *effective* than brute labour, and the profits arising from it so much greater, as to place the labourer on an equality with the farmer, if not above him.

In endeavouring to show that the working classes have it in their power to relieve themselves, we shall assume that the farmers and land-owners of the kingdom will employ two-thirds of the surplus population; not indeed exclusively in raising cattle food, *but in tilling and working up the produce of rich soils now in pasture*, leaving about fifty thousand families, or three hundred thousand persons to be provided with employment. Supposing the locating of every family to cost from £300 to £400, then twenty millions must be raised among themselves, a sum which does not equal what has already been deposited in the Savings' Banks, and in friendly societies. And as to the practicability of carrying into effect what has been proposed by public companies, composed of these classes, the thing is so apparent as to supersede the necessity of any formal argument.

Farmers and land-owners, by furnishing employment, will pay in wages, from which there will be a profit, what they now pay in poors' rates, and for which nothing is received in return, a bad name, bad feelings, and occasional predatory and incendiary visits excepted. It will therefore be their best interests to encourage the working classes, not only by advice and instruction, but by letting and selling them land, and assisting them occasionally with the means of working it: and the owners of waste land will find their own interests promoted by their doing so.

To this class of society, the plan proposed presents an opportunity of speedily improving their lands, and of augmenting the income, and of bettering the condition of the working classes, and such an opportunity has not before been presented.

If, for instance, a gentleman who has a large tract of waste land, were to begin by building cottages for the accommodation of as many families as would be requisite to till the land; and to let the land at such a price as would enable the working man to earn a comfortable living on the plan proposed, he would soon have his estate occupied by a thriving tenantry, and his rent-roll swelled beyond all precedent.

Tilling the ground without the aid of animal or brute force, implies the use of the hoe and the spade instead of the plough. In India the hoe is made to answer all the purposes which in England are accomplished by the plough. The spade is admirably suited to the plan proposed; and cannot be dispensed with in my system of husbandry, any more than in horticulture, which it would certainly resemble, more than it would the present system of farming. In mountainous districts the spade cannot be superseded by the plough; and it so happens that in those parts distress prevails to a much greater extent than in any other; because there is found no useful employment excepting that of a shepherd: and therefore, as one shepherd will take care of five or six hundred sheep, who will occupy double that number of acres; such districts must above all others be benefited by the system proposed, as they would afford the greatest facilities for improvement, and as the manual labourer would never be superseded either by brute force or by mechanical invention, or by the application of steam, or by any other elemental power.

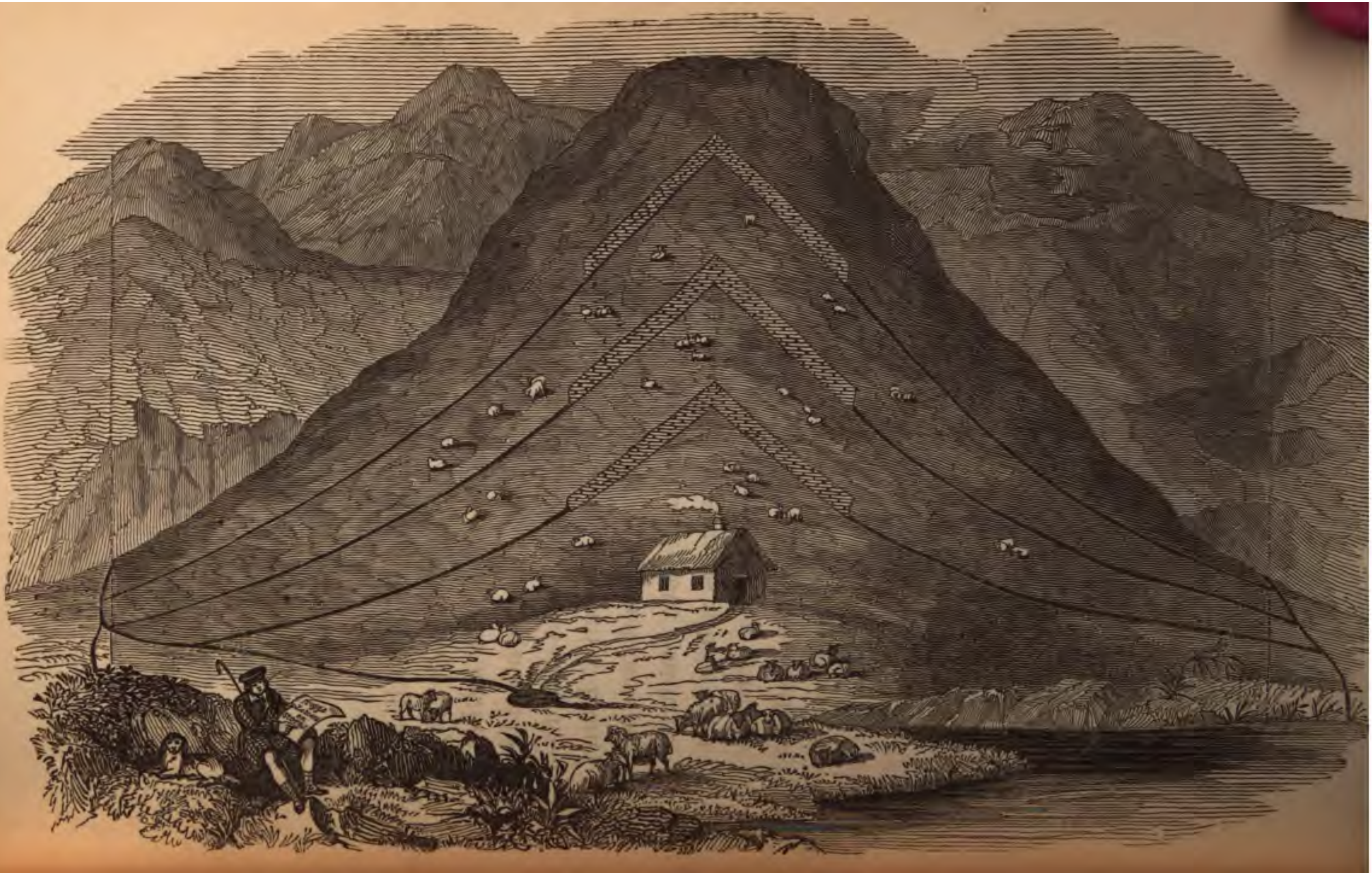
There is this advantage, also, in those situations—the proprietors, with few exceptions, have not incurred any expense in buildings that would be useless by this plan; which is not the case with poor clayey soils, *in tillage.*

The subject, however, of tilling such soils in situations here alluded to has been much agitated, especially with regard to Dartmoor, but it has never been proved that it could be accomplished; although soils equally sterile, but in a better climate have been, and are now being tilled with advantage by manual labour. That this system will be as well adapted to the climate of the regions just alluded to, will, I trust, be made equally apparent.

In making these remarks on *mountainous* situations, I am well aware of the injury to which they are exposed from floods and avalanches: and having travelled from one end of Scotland to the other in the Autumn of 1829, after one of the most destructive floods which ever visited that country, I am well aware of the fatal effects of such inundations on the cottages of the poor; and as I have reason to believe that a large number of cottages will be built in the Highlands of Scotland in accordance with the system proposed, I will offer some few suggestions in relation to the means of providing against such occurrences.

Instead of placing a cottage at the foot of a mountain, it should stand sufficiently high to be entirely out of danger from floods, as in the sketch annexed. The inconvenience of carrying water from the rivulet below, may be avoided by only directing a stream from the main drain, as appears in the drawing at the foot of the cottage.

But great as the danger and the damages may be from the floods, they are not equal to those of the large masses of snow which frequently slide down the sides of the mountains. In case of floods, notice



of approaching danger commonly arrives soon enough to give sufficient time to save both life and property; but although there may be some premonition of the falling of an avalanche, either by the changes of the atmosphere, or a ground thaw, yet such premonitions are not so easily perceived as those of an approaching flood. To guard against such dangers, is, however, practicable, and may be easily accomplished, and that in the most exposed situations. It may be effected by raising one or more banks in the rear of a cottage as shown in the drawing. It scarcely need be stated that the earth, peat turf, or stone, should be taken from the upper side, and that the banks should be constructed in a sloping direction from the base upwards, in the form of a sea bank. In taking the earth, &c. for this purpose, a ditch should not be formed, but on the contrary the ground from the foot of the bank to the spot where the last spit of turf is taken, should form an inclined *plane.* By having it in this form instead of a wide and deep ditch, all danger of sheep falling into it, when filled with drift snow would be avoided. It would also tend to sever avalanches, consequently in some degree relieve the bank. The first bank may be placed at such a distance from the house as to accommodate and protect in time of danger all the live stock that the cottager possesses, as well as his house, himself, and his family. The next and other banks, which need not be so high as the first, may be placed at such distances as to form inclosures of any desired extent. The lines extending from the lower ends of these defences in an oblique direction till they strike the straight lines running from the foot of the mountain upwards, represent small drains, or grips, to carry off the surplus water. Other grips for this purpose may be made in the interior, as occasion may require. The lines running from the foot of the mountain upwards, are intended to show the boundary fences of each cottager's plot or farm.

In situations (and there are many) where there is some bog which requires drainage, and on which ashes cannot be procured, manure may be obtained by bringing sheep from the higher ground in dry weather, and *folding* them upon the newly tilled and tender parts, in the same manner as in ordinary practice on summer fallows.

In consequence of the large quantity of undecayed vegetable matter upon the surface of peaty soils, while in a state of nature, they are extremely light at the first tilling, consequently must suffer from drought ; it is therefore needful to remark, that, although in a damp climate, care should be observed not to over-drain the sides of peaty mountains, a care which should increase at every step downwards ; it is therefore so obvious as not to require repeating, that such soils in a drier climate require still less of drainage.

As to the effect of climate, it may be added —if the Bedford level, on which only about one half as much rain falls as on the moors and mountains in the North of England and in Scotland, were drained as much as moors and mountains might be drained, it would suffer greatly from drought. This danger on the Bedford level is, however, obviated, in a great degree, by keeping the drains full of water in dry weather, which is an advantage not possessed by any other extensive tract of peat soil.

Easy as the task of draining may appear, the cottager would do well to consult respectable persons who have had practical experience in this important department; but we may add for his information, that there is a vast quantity of peat bog, just firm enough in summer and autumn, to sustain a man while working, but not sufficiently firm to bear the tread of sheep.

On the surface of *such* a bog, there is a quantity of moss, &c., in a living state, and of dead but undecayed vegetable matter, from 6 to 9 inches thick. At this depth decomposition commences, it would, therefore, appear that by tilling—trenching in stripes as shown by figure 3,* to such depth, as will bring to the surface a sufficient quantity of good, and well decayed vegetable matter, every purpose that could be anticipated, or desired will be answered thereby. In the absence of experience, I am not able to decide whether it will be better to burn a *few inches* of the surface, or to place it at the bottom. By placing it at the bottom, a more perfect drainage would be secured, than if the turf were burnt; and would certainly be the best mode, provided it did not cause the whole to be too light and *too dry*, from which there would be more to apprehend than from being too wet; but such a mode is most effective when most required. Should the land appear to be over-drained, the remedy is very easily effected, by digging up the turf *across* the tilled parts at intervals, of 40 yards or more, for by that means any *degree* of drainage may be effected which may be desired. As this, like many other things in agriculture, can only be proved by practice, the best, and indeed the only safe way, will be to adopt both modes. By laying the tilled earth, or peat, in ridges, two advantages would be obtained; first, exposing the newly digged soil to the action of the atmosphere in a more perfect manner than if laid flat; secondly, the openings or grips on each side, that is, between the tilled and the untilled parts, would secure immediate SURFACE DRAINAGE.

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* First taking care that there is a sufficient outfall for the water.

The untilled portion might be pared and burnt, and part of the ashes used for raising the first crop of turnips, and a small portion might be spread over the part from which the turf is taken, and sown with cocks-foot and rye-grass seeds, &c. In this state it would, in all probability, carry sheep the first winter while eating off the turnips raised on the tilled part, without poaching, if not, the turf should be left until the second year, when it would be sufficiently firm to carry sheep when pared and burnt, and sown with seeds. By sowing seeds on the tilled part, it would soon bear the tread of sheep, say in the 3rd or 4th year, when the other portion might be treated in the same manner. Although the depth here alluded to, will seldom exceed two feet, yet as it is at all times desirable to mix earthy matter with peat; to accomplish which, this observation as to depth would be deviated from. The expense would seldom exceed the value of a good crop of turnips.

These operations on peat in a tender state, will be best effected in the summer and autumn, and will be in a condition to receive the seed or *plants* in the month of June following without any other trouble than levelling the ridges and applying the ashes, as previously mentioned. As to the breadth of the stripes, it may be varied according to circumstances. Peat for instance resting upon strong clay, in a great degree impervious to water, the best breadth will in all probability be from three to three and a half yards, as stated at page 65.

On the other hand, peat upon an open, pervious soil, will require no such precaution; and therefore the breadth of the stripes may be varied from two feet to any breadth that may be desired, taking care *not to extend it so far as to render it difficult to cast the earth over the untilled part, for the purpose of receiving the manure of the sheep while eating the turnips.*

Laying this tilled earth or peat at a proper elevation, indeed of forming the stripes into lands as is done by the plough, so as to afford a ready fall for the water into the furrows, is already so well understood, that it is not necessary to describe it.

Having said that the cost of tilling peat bog would be repaid by one good crop of turnips, it is necessary to bear in mind, that it is supposed to be so situated, as not to require open drains to carry off the surplus water, but on an inclined plane, when the outfall is secured without any such expense.

Although the peat thus situated forms by far the largest portion of the whole, there is a very large quantity, especially in Ireland, submersed, and will require open drains, consequently, both more of time and money will be necessary to bring such lands into cultivation; two questions may, therefore, be asked—by what means may it be best effected?—and what prospect is there of repaying the cost?

I would answer the first by stating, that after a sufficient quantity of open drainage had been made, to carry off the surface water, and the bog so far consolidated as to bear a man, the mode already described may be adopted, the open drains receiving the soke—the surplus water directed into them by the means already stated, that is, by *reversing the order of the turf and the soil* to the depth of about two feet, in effect *soughing or underdraining*.

As to the second question, I would refer to the expense (and the profits) in draining the Great Bedford Level, with a main drain of 100 feet wide, with numerous other drains of all dimensions, down to the grip—with steam engines to empty them; and when thus drained, and with this annual expense, these peat soils, "30 feet in depth are worth from 50*l.* to 70*l.* an acre." Communications made by Joseph Glynn, Esq. Civil Engineer, of Butterley, by Derby, to the Society, instituted at London for the Encouragement of Arts, &c., vol. 51, p. 183, for which the Gold Isis Medal was voted for his application of steam power in draining fens:—

"I have drained two districts of fen-land, near March, in Cambridgeshire, where the engine's power bears about this proportion of 10 horses' power to 1,000 acres of land, and the water can always be kept down to any given distance below the roots of the plants. If the rain fall in excess, the water is thrown off by the engine; *if dry weather prevail, they can open the sluices without risk, and let the water flow in from the river, to fill the drains and moisten the earth.*

"The districts wherein I have been employed are eleven in number; the quantity of land drained or improved is about 90,000 acres, and the steam power used is equal to 620 horses.

"In many places, persons who were able to foresee the consequence of these improvements, and to avail themselves of it, have purchased land at from 10*l.* to 20*l.* an acre, which they may now sell at from 50*l.* to 70*l.* an acre, producing from four to six quarters of wheat to the acre."

Or take another example, that of soughing, or underdraining, with stone, tile, or wood on other soils, far more expensive to work than peat.

These observations, brief as they are, shew that peat soils in elevated situations, may be drained at less expense than those which are level; and as regards other soils, both the drainage and tillage will be so much less that no just estimate can be made of the difference.

The peat, and moory soils forming, as they do, by far the *largest proportion of the wastes* in Great Britain, and the mountainous parts of them doomed—condemned, as they have been, to perpetual sterility, render IT necessary to furnish such evidence as will remove these prejudices. Although so brilliant, so visible a light cannot in the first instance, be thrown upon this subject, as Mr. Winsor threw, by the introduction of gas, upon the streets in Pall Mall, to the dismay of a great number of persons whose education and station in life ought to have taught them better, at least to have been silent until they saw the *results*, induce me to furnish evidence on this subject at somewhat greater length than I at first contemplated.

Enough, I trust, having been said to prove that neither altitude (extreme and very small portions excepted, and those only in the most Northern parts of England and in Scotland) nor irregularity of surface will be any impediment, it is only necessary to adduce further proof as to the capabilities of PEAT and moory soils.

"To decompose bog, is alone sufficient for the production of the *finest plants.* It is, therefore, an inert, but inexhaustible DUNGHILL."—*Archer's Statistical Survey of the County of Dublin*, p. 445.

" At Woodstock several turnips have been taken up weighing from 16 lbs. to 18 lbs. each."—*Statistical Survey of the County of Dublin.*

"Good turnips as in the world on BOG in four months after the spade was put in.—*Mr. Allen's Colonies at Home, p.* 49.—This, and my own experiments on peat show, that although frost is a very cheap agent, it is not so indispensable as it is supposed to be.

Mr. Jacobs says, in describing part of the country in Denmark, "This is an excellent soil, equal to and not unlike our fen land in Lincolnshire and Cambridgeshire."

" Highlands of Scotland fit for pasture only—too wet (the climate is too damp) for grain; but potatoes and *turnips arrive at great perfection*, NO WHERE BETTER."—*Edinburgh Farmers' Magazine, vol.* XX. *p.* 275.

ROTATION—Those classes of persons to whom this part of our subject is addressed, whether of farm labourers who have not had much experience of such matters on their own account, or of tradesmen and mechanics, will need an outline of the method of proceeding upon; a given quantity of land adapted to one man and his family. But to give them such an outline that would be adapted to all situations, soils and climates, would be quite as difficult as that of stating the precise quantity of land, that a family under every variety of soil and climate; or that such a family under every variation of capability would be able to till. It is therefore with diffidence and reluctance that I offer the following outline, especially as this plan of raising, and feeding off winter cattle food on pasture land affords such great facilities of increasing or of decreasing the amount of labour, merely from the power, at all times to lay down to pasture with a profit, any portion of land that may be desired, and that with equal certainty of success in breaking it up; thus augmenting or diminishing the amount of labour, or of any particular kind of produce, with a facility heretofore unprecedented in the art of agriculture.*

It should be always borne in mind, that such a quantity of turnips should be raised as will keep the land in high condition; and I would add, not more, from a conviction that *it will in future be just as easy to make the land too rich for the producing of grain; as it had been difficult to prevent sterility.* It will therefore be perceived, that deviations will be so easily made, as to preclude the necessity of directions.

I will however just state that when it is desired to reduce the quantity of turnips, beans may be dibbled in every alternate row or hole, beans in preference to any other produce; first, because sheep will not destroy them while eating off the grass, and because there is no danger from lodging, and thereby overlaying the turnips. By planting six beans of ordinary size, in every twelve inches square of tilled ground, two-thirds as much seed will be used, as when two bushels per acre are dibbled at equal distances in the ordinary way: and if two thirds of a full crop are not obtained, there will be more than half. But as I have not satisfied myself on this point, it will be advisable to place four in some holes and six in others; and by that means find out the proper number. The early bean should be always used, which in the South of England, will be reaped early in Autumn.

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* These advantages would be greatly aided by the agriculturists being put in possession of the state of crops immediately after the harvest, and as I have not seen a better mode proposed than the one I offered some years ago, I will introduce it. See Appendix.

From the course or rotations suggested, it will be perceived, that there may be if required, twice the quantity of land appropriated to summer pasture, and to tares and clover; so that after the land has been sufficiently enriched by the manure of sheep, with the aid of leaves, it will afford an opportunity of mowing as much grass or clover, and of making as much hay every year, as will amount in the aggregate, to a large stock on hand; which will be a sufficient security against the inconvenience that would otherwise arise on a partial failure of the winter's crop.

After the first crop of turnips, as much ground should be tilled for grain or flax, or both, as would furnish employment during such times in the following years, as labour may not be required in the field. The soil is supposed to be very poor, the less of it therefore that is tilled for grain the better, until sufficiently enriched first by ashes, and then by sheep manure. Therefore as one acre of flax supplies nearly ten times as much labour as an acre of grain, I should advise flax to be grown exclusively until a sufficient quantity of land be fertilized for the raising of grain.

Should there still be any doubt whether there would be sufficient manure for flax from one crop of turnips, on a soil so poor, such doubt would be removed by folding the sheep by night for a while upon the two acres intended for flax, while eating off the other portion of turnips. I will suppose two acres of flax at this period to furnish the required employment, and I will suppose one-third of the manure made in consuming the other portion of turnips, to be made by folding on the two acres intended for flax, a quantity of manure may be made equal to three crops of turnips in succession on the spot where the first crop of flax is to be produced, by which means a quantity of manure will be deposited that could not be purchased and carted to the place for less than ten pounds. Indeed, in mountain districts, manure could not be obtained in any other way; as it could not be accomplished.

The various operations required in raising and preparing two acres of flax for the market, would go so far towards supplying employment for a man, that he would not be able to do more towards preparing for the next crop of turnips than to take the earth out of the holes, leaving his family to attend to the flocks, and return the earth into the holes; but they would have time to assist him occasionally, both in preparing the flax, and in taking the earth out of the holes.

Third year. The spot on which the flax had grown, would be in excellent condition, for any kind of grain, and for wheat in particular: but as the proportion of land, in summer pasture, would not afford sufficient support for the flock from one year's manuring by the sheep on turnips, tares might be sown; thus in the *second* year, reversing the present order of things, in regard to the support of stock in summer and winter.

It will be perceived that in the fourth and following years, such a quantity of ground may be tilled, as may seem best adapted to the means of working it, and of preparing the produce for the market; and of keeping every kind of agency both animal and human in the *best possible condition.*

As the land so appropriated, will not be well adapted to barley, such soil being already occupied by the present system of husbandry, one of the rotations will be three or *more* crops of turnips in succession on the seeds, succeeded by wheat, tares, and wheat, &c. with seeds sown in the succeeding spring. Seeds sown with the third crop of grain on land tilled in the ordinary way would lead to ruin rather than to profit. It must be therefore, borne in mind, that in this case, the land is supposed to be tilled with the spade, and to be in high condition at the commencement of this course of cropping; consequently, if one digging be equal to three or four ploughings and harrowings, the land may be considered in better condition than if it had been fallowed according to the common practice. It may also be kept in mind, (as a distinction between the two modes) that the young grasses will in the *second* and after-years, be abundantly supplied with manure. The rotation, if we may call it so, will be one portion of the whole bearing a double crop of cattle food, (turnips and grass) and the other bearing grain, flax, or hemp. Although it has been stated, that tares may be taken between the grain crops, as a means of keeping up the fertility, land enriched as this will be, will carry three or four crops of wheat in succession.

We shall add an estimate of expenses in tilling eighteen acres, (in plots of two acres each) which is the quantity that we suppose a man with his family would cultivate; and to render my meaning more easy to be understood, I will suppose it to be in rotation. But I beg to state most distinctly that it is without any pretensions to accuracy. Among other reasons for this declaration, are the following—

First. Difference in the texture of land, and the amount of labour required on the same soils in different seasons.

Second. Difference in the price of labour not only in various parts of the country at the same time, but throughout the country at different periods.

Third. Difference in the amount of produce from the same amount of labour and land, from a difference in the seasons.

Fourth. Difference in the *price* of produce.

Disposition of Eighteen Acres in plots of Two Acres, and an estimate of the probable expense and profit.

	£	s.	d.
Holing 2 acres on the seeds, say	4	0	0
Taking as much earth out of the old holes of 6 acres as will cover the three-fourths of the ground about one inch thick, at 15s. an acre, say	5	0	0
Pulverizing and returning the earth into the holes of 8 acres	6	0	0
Seed for 8 acres	0	8	0
Transplanting ditto, 8 acres at 4s.	1	12	0
Hoeing or stirring the earth of ditto, say	1	0	0
*Pulling and slicing 8 acres of turnips, 30 tons an acre at 4d. per ton	4	0	0
Digging and dibbling in the seed of eight acres† of grain, or part flax or tares, at 60s. an acre	24	0	0
Weeding	1	0	0
Reaping and carrying 8 acres at 20s	8	0	0
Thrashing—and suppose two-thirds of it wheat, at twenty-five bushels per acre, at 6d. per bushel	5	0	0
As all this is supposed to be effected by manual labour, I will say for filling, wheeling, and placing in the holes for turnips, the dung made from the straw, &c. say thirty tons in a wet state fit for use‡	2	0	0
Rent and Taxes	20	0	0
	£82	0	0

ESTIMATE OF PRODUCE.

	£	s,	d,
Eight acres of turnips at 30 tons an acre, and allowing each sheep 20 lbs. per day, will feed (fatten) 160 sheep six months, instead however of 160 sheep, I will say 100, and that they gain 5d. a week each	54	3	4
Say for the summer pasture (seeds‖) and the leaves half this amount	27	1	8
And a cow	10	0	0
Eight acres of grain and two thirds of it wheat, twenty-five bushels an acre, (over and above the seed) at 6s. a bushel ..	60	0	0
	151		
Deduct expenses	82	0	0
Amount of profit on £375 over and above 5 per cent........	£69	5	0

Another rotation may be adopted, which will under many circumstances, be far superior to the last.

Instead of taking two, three, or more crops of turnips in succession, on PASTURE, the plot may, after the second or third crop has been consumed, be dug, and the manure from the holes or stripes, mix-

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* Ten shillings an acre is paid round London for pulling, cutting off the tops and roots of mangel wurzel, and carrying it; that is, piling it in heaps, say forty to fifty tons an acre. Mr. Gardiner, of Banbury, says, that with his Patent Turnip Cutting Machine, which is the best I have seen, "a stout lad will cut from one to two bushels of turnips per minute, into pieces three-quarters of an inch wide, and half an inch thick—sizes suitable for sheep and lambs."

† Leaving 4 acres either to be mown or grazed.

‡ This is considerably more than it will cost, 1s. per ton is plenty, and quite sufficient for raising a crop of turnips on the two acres of seeds.

‖ Seeds, when the land is in good condition will support as much stock as rich old pasture land.

ed with the whole of the dug ground, in other words, *fallowed*,* and planted with turnips,

In October, or immediately after the first frost that should cause the leaves to droop, or in the absence of frost, I would dibble wheat among the turnips, first stripping off the largest leaves. A space sufficiently broad whereon to do this withont injuring the turnips may be dug.

The rows of wheat should not be more than twelve inches apart, and as turnips are generally placed this distance one way, and from eighteen to thirty inches the other way, the wheat should be dibbled in the intervals of twelve inches. As stripping off the leaves in the first instance is done to facilitate the digging and dibbling, those only in the *narrow spaces* need be taken off for this purpose—the rest as required for the stock. Those who may prefer digging all the land before dibbling the wheat, may do so by deferring the seed season until the turnip is matured. When this is done the turnip may be placed between the rows of wheat without in the least interfering with this operation, or with the growth of the wheat afterwards.

These two circumstances, one being able to dibble *before* the turnips are matured; the other, that the dibbling may be *deferred* till they are ripe, render further observation unnecessary.

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* It is admitted, that one digging is equal to three ploughings, draggings, harrowings, rollings, &c., some say it is equal to five or six, I therefore feel justified in considering one digging equal to a fallow.

It is stated repeatedly in this section, that no animal labour should be employed, that all ALL THE WINTER FOOD SHOULD BE CONSUMED ON THE SPOT WHERE RAISED, and having now got a crop on a tilled soil too wet to carry sheep, the next consideration is as to the mode of accomplishing the object without " carrying it off on the backs of horses in panniers," or " carting it at an expense of £3. an acre."

This may be done not only without the trouble and expense, just stated, but quite as effectually as regards enriching the land, and much *more* effectually as regards *improving the wool* than is now done on the light turnip soils, by a method as simple and easily accomplished as that of raising the turnip upon pasture land, by OPENED-BOTTOMED SHEEP FOLDS.

It is a fortunate circumstance for that class of persons to whom these folds will be of greatest service, that the construction and the application of them will be so easily accomplished. The floor may be made of deal or other wood sawed into laths or bars, from one inch square to one and a half, which may be placed three quarters of an inch apart. The mode of putting the floor together will be well understood by every country carpenter; so that it will be necessary only to state that to strengthen the floor, bars somewhat stronger than those which compose the floor, may be attached to the under side transversely, at about two feet apart as shown in the drawing of a sheepcote, p. 116

The distance between the bars, I find by experience, answers all the purposes of allowing the dung to pass through, without admitting the foot of the sheep. For obvious reasons, the fold should be placed upon wheels, block wheels from nine to twelve inches in diameter, that the fold may be the more easily moved from day to day, so as to manure the land evenly, planks should be provided, for the wheels to travel upon, with brackets to prevent their sliding off; and that the planks may be rightly placed, two small rods, with a bolt at each end, may be dropped into the holes made in the planks to receive them; by means of which they will travel on the trams with as much certainty and ease as on a railway. Nothing more will be required to form a fold, than to surround the floor with hurdles, put down as in common practice when feeding off turnips or tares.

But although a fold so constructed may be the cheapest mode, it will not be the best mode that might be adopted; I should therefore recommend a complete fold to be made in the first instance, by morticing together as many poles as may be necessary for a fold of the requisite dimensions. The poles should be flat on the upper side, for the floor to rest upon: and on the frame a fence might be constructed in exactly the same manner as common hurdles are made; but it will be desirable, for reasons hereafter stated, that the wattle-work should be closer and higher (at least one side of it) than the common hurdle.*

In placing the fence upon the frame, sufficient room should be left in the inner part to receive the floor to rest upon; the upright staves should not be placed in the centre, but rather towards the outer side of the frame work. When this plan is adopted, the block-wheel should be attached to the frame, and not to the floor. It will be perceived, that by a frame and floor so constructed, *the working man, in a few* MINUTES, *may obtain for his flock a drier lodging than can be had upon the driest turnip soils; and the process of fattening his flock, and of fertilizing the land will still be going on: and when the weather is fine, and the land sufficiently dry to bear the tread of the sheep, the floor may be removed, and the advantages of treading the young wheat be secured.*

To save time, and avoid treading in wet weather, by shifting the floor, two small rollers might be placed under the floor, as a means of passing the planks or tram from one end of the fold to the other, and the whole, containing the sheep, to the extent of four tons in weight, may be moved by one man, by placing a crow-bar against the hinder part, with the point on the tram, so as to secure the greatest lever-age. Should the fold with the sheep be too heavy to be removed in that way, the difficulty may be overcome by placing a few hurdles behind the fold for the sheep to stand upon while removing the fold; and one-third of the dimensions of the fold will be sufficient. They may also be placed on common wooden block wheels, and the whole inclosed with old netting; all of them of the commonest workmanship, which any lad sixteen years old might construct. The sheep may return to the fold on a hurdle placed for that purpose. On moving the principal fold, there would be left a space between the folds by which the sheep would escape if some method of preventing it were not adopted: a piece of netting may therefore be placed on each side, of sufficient length to prevent their escape, so as to form a fence. As these shiftings would not always be of the same distance, but would vary according to the quantity or weight of turnips; the same length of net would not be always required, but that difficulty would be easily overcome, by attaching the net to hooks, so that the length of the netting could be adapted to every variation.

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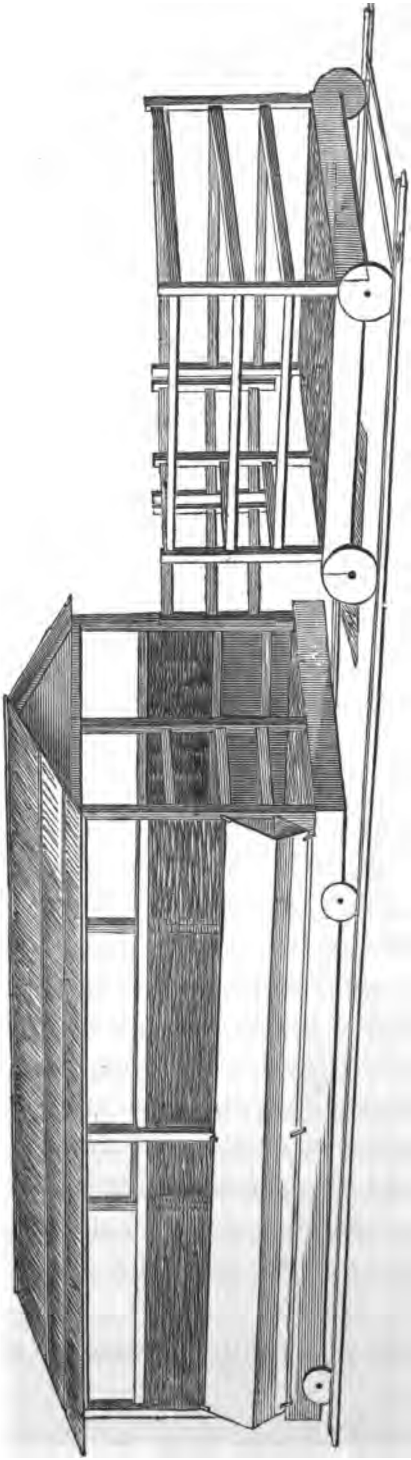
* Should it be thought, that by making the wattle work closer and higher than is usual, the sheep may be too warm; one side may be made with only 5 or 6 bars, somewhat like those made of sawed or rent wood. The other side could be presented to the cold wind in winter, and to the south in summer to protect stock from the scorching heat of the sun.

It would not be more difficult to prove, that there would be a saving of expense, compared with the present mode of shifting and placing the hurdles, than to prove that hurdles so constructed would afford a better shelter than a thin hedge would afford, with a ditch behind it, as is frequently the case; so that the sheep are three or four yards distant from that leafless shelter. I am aware, it may be said, that the protection which a hedge affords is not the only inducement to retire to the lee side of it, and that it frequently happens that the ground near the hedge will afford a drier lodging for the sheep. All this may be admitted; but it will not remove the evil of over-manuring one part of the field at the expense of the other, nor prevent the loss of flesh, nor the injury which the wool sustains thereby.

Either this great sacrifice of health to damp lodgings must continue, or a very high price must be paid for carting turnips into a grass field, or to the homestead. In confirmation of this, every flock master will admit that his sheep do not only not thrive so well in wet as in dry weather, when eating off turnip on dry soils; but that they even lose weight in stormy weather,—what then is the result on soils containing just so much clay as to cause them to puddle? It is this, the stock do not gain so much weight as on dry soils by 50 per cent. and if still more wet than what is here alluded to, they do not fatten at all, but would even *lose flesh* if they were not supplied with hay.

Now, if a dry lodging can be provided in the turnip field at a less expense than carting, or that of loss by cold,—in other words, *if it can be shown that this inconvenience may be overcome with a profit, it will be adopted ultimately; for the system proposed will force its way into use, as certainly as turnip husbandry has forced its way on sandy soils.*



The only objection that I am now aware of, will be the trouble of removing the floor, placing and replacing the open bottom; which if required to be done daily, as in shifting hurdles, would be an objection; but as the change will be required only in a change of weather, no such objection can be reasonably taken.

Having now got so great a part of a house, viz. the floor and the sides, and no gavels being required, it would seem worthy of our consideration, whether it would not be advisable to add a roof. A Member of the Society for the Prevention of Cruelty to Animals would say at once it should be done: a manufacturer of woollen cloths would join therein, and would support his opinion by the example of Saxony and Spain in housing sheep: the mountain shepherd would recount the deaths that have occurred from want of shelter,and would support his argument by saying it would be better than his "piling up dead sheep, as a means of protecting the living from perishing by the same cause." Nor ought we to forget, that in a storm of snow, "seventeen shepherds perished in one night between Crawford Muir and the border, and one farmer lost seventy-two score of sheep, and many others in the same quarter from thirty to forty score each." To these considerations we may add all the advantages of eating sound mutton, or that which is affected by the rot, which will be hereafter explained.

This contrivance begun with an improved shield, or better sort of hedge, as a protection from the wind, and has grown up into a better lodging for—and lastly into a complete house, as will appear in the appended print, which is at once a protection against all that can be dreaded from the fury of the elements; so that such calamities may now not only be avoided, but the small and coarse-woolled sheep, half-starved upon the mountains, may be exchanged for the best of breeds. But mere unsupported opinions on the subject of sheep cotes, are entirely useless; and as no proof can be adduced from practice in Great Britain, upon a scale sufficiently extensive, I must be content for the present with again referring to the Saxon method of housing their sheep, and that too, for the purpose of improving the wool, and for that only. Now, as sheep are valued nearly three-fold more in Great Britain for the profit arising from the flesh, above that of the wool, and that with as great inducement to turn the wool to advantage as the Germans have; and in regard to manure with greater inducement, and the proportion being measured by the difference in the price of grain between the two countries,—to say that sheep cotes would not be profitable, is an assertion which few persons would venture to make.

That there are many persons whose apparent interests will induce them to oppose the system of carrying out the system proposed, there can be but little doubt: such as the owners and occupiers of those lands as are either not adapted to the plan, or only in a slight degree, which are the rich pasture lands, sandy soils, and stone-brash,* and on which there is not sufficient depth of soil. Before, however, such opposition would be rendered reasonable, I think it would be proved that keeping sheep by some of the methods herein stated, for the purpose *of improving the wool and the making of manure only, would not be unprofitable.*

In support of these opinions on the subject of cotes for the preserving of the Wool, I would refer to Bakewell's Treatise on Wool; Smith's Memoirs of Wool; Smith on the Causes of the difference in the Colour of Man; and White on the gradation in Man: the two last of these authorities have adduced very numerous examples of the wonderful effects produced upon the hair of human beings, by an exposure to the different changes of heat and cold; and have shown that the same effects are produced on wool; and by consequence, the very great importance of our avoiding such exposures.

This subject has been still more elucidated by an individual, whose skill as a practical farmer was equalled only by his fame as a general and a statesman:—

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*The working man who possesses land of this character, may peruse with advantage, the following observation of Dr. Johnson:—"If a man was to compare the effect of a single stroke of a pickaxe, or of one impression of the spade, with the general design and last result, he would be overwhelmed by the sense of their disproportion; yet, those petty operations incessantly continued, in time surmount the greatest difficulties, and mountains are levelled, and oceans bounded by the slender force of human beings."

"Our domestic animals, as well as our agriculture, are inferior to yours in point of size; but this does not proceed from any defect in the stamina of them, but to deficient care in providing for their support, experience having abundantly evinced, that where our pastures are as well improved, as the soil and climate will admit,—where a competent store of wholesome provender is laid up, and proper care used in serving it, that our horses, black cattle, sheep, &c. are not inferior to the best of their respective kinds, which have been imported from England. Nor is the wool of our sheep inferior to that of the common sort with you. As a proof, after the peace of Paris in 1783, and my *return to the occupations of a farmer, I paid particular attention to my breed of sheep* (of which I usually kept about seven or eight hundred.) By this attention, at the shearing of 1789, the fleeces yielded me the average quantity of 5¼ lbs. of wool; a fleece of which, promiscuously taken, I sent to Mr. Arthur Young, who put it for examination into the hands of manufacturers. These pronounced it to be equal in quality to the Kentish wool. In this same year, *i. e.* 1789, I was again called from home, and have not had it in my power since to pay any attention to my farm; the consequence of which is, that my sheep, at the last shearing, yielded me not more than 2½ lbs. —GEORGE WASHINGTON.—*Correspondence of the Right Honourable Sir John Sinclair Bart.*, vol. ii. p. 19.

The subject of sheep folds and cotes being entirely of a pecuniary nature, may be as easily put to the test by the working man with his small flock, as by the scientific farmer with his large ones.

The greatest error in the housing of sheep is that of putting too many of them together; and although the working man's flock will be small, yet his limited means may possibly betray him into that error: he, however, had better use folds, the expense of which compared with cotes is only small, than crowd too many into a small shed or cote. I know a case, in which a shed was made for 600 sheep, and sufficiently spacious to allow the sheep to move, and that without any walls—on pillars; but by being *too many together*, the place became too warm and even hot: for on going out of the shed, the effect resembled that which is produced on hot-house plants by a sudden exposure to a lower temperature than that in which they had been reared.

It should be borne in mind, that three different kinds of folds might be adopted: folds without floor or covering—folds with a covering which may be called cotes—and cotes without floors. The first, if kept well bedded in wet weather, may answer as a means of avoiding the rot; but a perfect cote would be an effectual security, and the wool would be much improved thereby, both in quantity and in quality, the profit of which would far exceed the interest of the capital expended in cotes. And all these advantages would be independent of the profit to be derived from the making of wet soils to answer all the purposes of dry ones; and which would in time produce as great an advance in the price of poor, cold and heavy soils, as turnip husbandry has produced in the price of dry ones.

I have already noticed the subject of growing wheat among the turnips, but have done it only imperfectly: (p. 111) as it will, I trust, become a matter of great importance to a working man, some farther information may be deemed desirable. And as to the first objection—that in consequence of not being able to till all the ground immediately, before the dibbling of the seed-wheat, according to the common practice, I will only repeat, that enough for the purpose may be dug at the time of dibbling, which will not exceed one spit in breadth,—and the other part immediately after the sheep have eaten the turnips.

As the average depth at which the land in England is ploughed is said not to exceed five inches, that depth may be easily dug between the rows of wheat, leaving the land thereby in the best state in regard to tillage; and will be far superior to the present practice of consuming turnips on wheat, and of allowing the dung to be exposed to the withering power of wind and the sun. I would therefore dibble the wheat between the rows of turnips, and dig the remainder of the ground afterwards. By doing so, the ground will be much firmer than if the whole were tilled in the autumn; and consequently the *open bottom of the cote* would not require so frequently to be removed while eating off the produce.

By digging and covering the manure, that will be easily accomplished which the farmer is always so anxious to effect, which is *to incorporate the manure with that part of the soil which will be most occupied by the fibres of the grain;* and which is not done when the turnips are consumed on wheat according to the present practice, except by means of hoeing, which is at the best only an *imperfect operation*, and is performed after the dung has been for two or three weeks exposed to the action of the wind and the sun.

The advantages of consuming turnips upon tilled land, has been already made sufficiently apparent, by the practice of nearly half a century in England on soils sufficiently dry for that purpose: it has been also proved, that by carting them from field to field to be consumed on the land either before or after the wheat is up, and on those soils which are so wet as to render the practice troublesome, uncertain, and expensive, together with the inconvenience of having to remove the sheep in wet weather, much inconvenience has been occasioned. I have seen turnips carted more than a mile for such a purpose, and the sheep driven a great distance to and fro, on every change of weather, to avoid poaching. Taking therefore the actual outlay of carting, the loss of flesh, and of manure in travelling, and the disappointment occasioned by wet weather in not being able to accomplish all that could be wished,—it will remain to be determined by experience whether such a practice can be better or cheaper than that of feeding off the turnips where they grew, by means of open-bottomed floors.

The object therefore of the plan alluded to, is that of obviating all these difficulties, and avoiding the expense of carting to the amount of three pounds an acre to the working man; for it will have been perceived, that a horse has not been mentioned in connexion with the plan proposed, except to show that such an animal may be dispensed with, either with *pattens* as on chat moss, or with panniers as before reported. "Nor that a working man be tempted to oppose his better reason, and cultivate the turnip on wet soils." Should this open-bottomed sheep fold answer, as I anticipate, it will be useful in other situations and for other purposes.

Here let me observe that there is nothing new in my proposed sheep fold, excepting that it is to have an open grate-like bottom; and as sheep cotes have been strongly recommended by Englishmen of agricultural eminence, and as they have been adopted already in several parts of Europe, these facts may serve to avert the ridicule which might have been otherwise exacted among the *enemies of all innovation.*

In my estimate of expenses, I have omitted the articles of cotes; for, in truth, nothing ought to be charged on that account, inasmuch as the profits arising from the use of them, above what would be realized without them, would of itself exceed the amount of the original cost, or otherwise, indeed, they would be useless. But the system here proposed is nothing less than an attempt to effect the producing of winter cattle food, by means of the *spade, from the lowest swamp to the mountain top;* and which is a system admirably adapted to Ireland, and to the kingdom of France:* to the former in consequence of the almost universal use of the spade, and to the latter on account of the small allotment system which prevails in that country, and the sterility consequent thereon. But although we have mentioned France and Ireland in particular, it is impossible to prescribe any limits beyond which it may not pass, if it were but adopted as widely as it might be adopted with advantage to mankind, as it would be *impossible to say at what* ALTITUDE, *or under what circumstances it would cease to be of service to the soil.*

Pliny is explicit as to the temperature suited to the turnip; and as so ancient and respectable authority, he having written above eighteen hundred years ago, is so highly deserving of attention, I will give his words at some considerable length. He says:—

"Of Rapes or Navews: of Amiternum turnips now let us proceed and passe to other matters: and yet in this discourse, it is meet to write somewhat as touching rapes and navews. The Latine writers our countrymen, have slightly passed by and touched them only by the way. The Greeks have treated of them somewhat more diligently, and yet among pot herbs and woorts growing in gardens; whereas indeed according to good order they would be spoken off immediately after corne, or beanes at leastwise, considering there is not a plant of *more or better use* than is the rape or navew. First and foremost, they grow not only for beasts of the earth and the foules of the aire, but also for men * * * They will keepe long and last all winter, both within the ground where they grew: and being well wintered, *they will continue afterwards out of the earth lying abroad even almost till new come:** so as they yield men great comfort to withstand all hunger and famine.

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* The tillage lands of both which countries are equally impoverished, one from over production of wheat, and the other from potatoes.

" It is not choise and daintie of the ground where it will grow: for lightly it will prosper where nothing els can be sowed. *In foggie mists, hard frosts, and other cold weather, it thriveth passing wel*, and growith to a wonderful bignesse. I have seen one of their roots weigh above fortie pounds. * * *

" The Greeke writers have divided them by the sexe, and thereby made two principall kinds thereof, to wit, the male and the female.

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* Query. May it not be fairly assumed, that it is what we call the Swedish turnip which is here spoken of.

" But of all rapes male or female, three especiall sorts there be and no more. For some roots spread *flat* and broad, others are knit round like a ball; the third sort which runneth downe into the ground with a long root in manner of a raddish, they call wild rape or navew.

" As for the turnips of Amiternum, they bee in a manner of the same nature that the rapes aforesaid, and cold they love as well. Vol. i. p. 570.

" Physicians have set downe five kinds of navews, namely, the Corinthian, the Cleonœan, the Liothosian, the Bœotian, and that which simply by it selfe they called the *greene* navew. Of all these, the Corinthian navews grow to a great bignesse, and in manner all the root is seen naked above the ground: for this is the only kind that coveteth to be aloft, and groweth not downward into the earth as the rest doe. As for the Liothosian (some call it also the Thracian) of all others *it will abide and endure frost and cold weather best*. Next to it, is the Bœotian navew, sweet in taste, differing from the rest in the notable shortnesse and roundnesse withall that the root carrieth; nothing at all like to the Ceonœan, which is passing long. Generally, this is observed as a rule, that all navews, the slenderer, smaller, and *smoother* leaves that they beare, the more pleasant is the root to the tast:* and contrariwise, the rougher that they be, the more cornered also and prickie, the bitterer they are. There is a wild kind of them besides, the leaves thereof resemble rocket. The best navews that are sold at Rome, be those that come from Amiternum in Bruzze. The next to them in goodnesse, are those of Nursium. In the third place are to be raunged, which our country about Verona yieldeth." *Vol.* ii. *p.* 16. *The History of the World, commonly called, the Natural History of C. Plinius Secundus.* "*Translated into English by Philemon Holland, Doctor in Physicke,* 1601."

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* Additional proof that this the Swede.

These statements, as to the temperature and soils adapted to the turnip, are well supported to the present time. Dr. Imlay says—"Turnips and mangel-wurzel thrive exceedingly well in *Australia*—measured a turnip twenty-seven inches in girt. In another account it is stated, that "turnips succeed amazingly." *Dr. Imlay's Excursion to the Murray.*

Thus, proving by the dry climate of Australia the correctness of Pliny's statement, thrt "turnips are nourished by mists, hoar-frosts, and cold, to a prodigious bulk."

"The *mountain* ground of this country produces excellent crops of turnips after a slight burning."—*Irish Report to the Board of Agriculture.*

"The Lammermuir Hills, Berwickshire, *too high for tillage,* harvest three or four weeks later than those in the lower part of the country. Crops in the early part of the season look as well as in the lower country, but not sufficiently warm to mature them one season in ten."

" TURNIPS AND HAY are by far the most valuable, as they are the most necessary crops that can be raised in a HIGH country."

" A hoar frost that so frequently destroys or stops the growth of potatoes, and DESTROYS *grain crops*, DOES NOT EVEN AFFECT TURNIPS."—*Edinburgh Farmers' Magazine, vol.* xxiv. *p.* 240.

As the governments of France and Great Britain have thought that the public interest has required them to restrain the cultivation of the beet-root for the making of sugar, the small farmer and the cottager may turn their attention to the cultivation of that root, as a means of *renovating their worn out tillage land.*

Whenever it is desired to sow tillage land with clover and grass seeds without previously sowing it with grain after the turnips, the turnips may be placed from 2 to 3 feet apart, the impress of which will be a guide for the making of holes at the next crop: and in that case, the earth which is thrown out to receive the manure of the sheep, should not remain on seeds longer than a few days. But it is hardly likely that it will be found necessary to adopt that plan, as the manure made from the straw *and applied to a first crop*, will serve for a second; so that it would not be necessary to throw the earth over the seeds. It will also be perceived that the open-bottomed cotes or folds will be extremely useful in the winter, and especially in wet weather, and while consuming turnips on cold wet *pasture* lands;

not only in relation to the flesh and the wool, but in guarding against the rot.

But if an advantageous method of consuming turnips on wet soils can be adopted upon tillage land as well as upon pasture, the public at large, as well as the owners of the soil, will derive more advantage from that practice, than has been hitherto derived from turnip on dry soils, or ever can be; inasmuch as the quantity of the latter bears but a small proportion to the former; and because every other soil is better adapted than a dry soil to the Swedish turnip, which is the most valuable turnip: and because the manure of sheep being of a hot nature is the more suitable to cold soils.

It is therefore clear, that strong soils are better suited than light soils for turnips, both in relation to produce and manure, as well as for the growing of wheat: so that if it should be proved that there will be a profit arising from the wool and the manure sufficient to meet the interest of expense in cotes, besides all profit in the additional weight of flesh procured thereby, cotes will surely be adopted even on dry soils, as they are now in Saxony, but in another form. From what has been already stated, it is clear that all lands on which there is sufficient depth of soil may be converted into tillage, either by raising grain or flax: and as the production of grain can only be stopped by climate, and not by natural sterility, as heretofore has been the case, *some idea may be formed of the augmented means of human sup-*

port by the system proposed, and especially in relation to BREAD. As to meat, *the next important article of human support,* enough has been already said to prove, not only the vast increase, but the importance of the increase, as a means of augmenting that of the first necessary — bread. To accomplish all these purposes with most success, nothing more will be required than to provide dry lodging: to do, in fact, what is already done for every other animal upon the farm, even the pig, which is supplied with a dry lodging at an expense as much above that which we require for the accommodation of the sheep, as the profit of the sheep exceeds the profit of the swine.

On the difference between rich and poor soils in the quality of the turnip, I have frequently heard it said, that turnips raised on poor soils will not fatten sheep without the help of hay: but when I have reminded them that the greatest portion of the driest turnip soils are by nature the poorest soils, they have been confounded. The real state of the case is this, the lands alluded to did not afford dry lodging for the sheep, and that was in reality the cause they did not fatten. Since writing the above, the following accounts have been published; and as they exceed my own estimate in relation to the profit to be derived from the use of cotes, they will not require any comment of mine.

"*Agricultural Meeting at Oxford.*

"Mr. Handley, M.P. next read a communication "from Mr. Childers, M.P., on the advantages of "shed feeding for sheep. The latter gentleman had "made some interesting experiments by placing a "score of sheep in a shed, contrasting them with a "similar number kept in the open ground, each "being fed upon turnips. A great advantage was "proved in favour of the former system, for whilst, "in the course of *three months*, the score contained "in the shed increased in weight 56 st. 6 lbs.; those "in the fields had added to their weight but 36 st. 8lbs."—*Jackson's Oxford Journal, July* 30, 1839.

"I have a flock of pure merino, and a flock of anglo-merino, of which peculiar sort I have exhibited specimens at the Smithfield show, and at Oxford, and shall again at Smithfield show next month; I have now had three years' experience of the practice, and am decidedly of opinion that the *fatting stock thrive quicker, and the sheep with their lambs, also do better than out of doors.* I begin in November to put them in the yards at night letting them out in the day; as the season advances, I shorten the period of going abroad, till at length they are not allowed to go out at all, except that when there happens to be a fine sunny day in winter. That sheep do not suffer from confinement, I have abundant other proof; the merino rams fight so furiously, that I often tie them up like horses in a stall, and keep them there from season to season, and they are as healthy as any that are out, and will get sometimes very fat. As a subject of curious experiment, I keep three pure merino wethers every year in their wool, three successive seasons from the time of their being sixteen months old, till they are shorn of their three years' fleece, they are never out of the house, and I never knew them otherwise than healthy, and in good fleshy condition, when stripped of their three-year-old fleece. I sent one to Oxford that was exceedingly fat, after having a fleece taken from him that weighed 28 lbs., and I shall exhibit another next month extravagantly fat, with a fleece of 30 lbs. weight."—*Lord Western's Letter to the Editors of the Farmers' Journal, Dec.* 9, 1839.

"As our readers may readily conceive, a more unfavourable month than the past could not have been for turnip sheep. Many hundreds have been driven out of the pens; indeed, except upon dry light soils, *it has been impossible for them to exist.*"—*Agricultural Reports, Northamptonshire: Farmers' Journal, Dec.* 9, 1839.

Allusions have been made to sandy soils, which have hitherto monopolized the turnip, or rather the profitable production of it. I think it probable that at no distant period, wheat will be dibbled upon them and among the turnips, and the turnips be consumed among the young wheat, as we have stated in relation to wet lands; but of course without those additional expenses which are unavoidable on all wet soils; unless it should be proved that the shelter afforded to the sheep would more than counter-balance that additional expense.

On the subject of raising wheat on dry soils in preference to other grain, my reasons are these: —First, wheat is more profitable than barley; Secondly, in raising wheat on such lands, there is less danger from drought than in barley; for it is well known, that wheat seldom suffers in this climate from drought, but frequently from too much wet, while barley often suffers from drought.

Another mode of ascertaining the value of open-bottomed sheep cotes, as a method of restoring poor cold exhausted soils in tillage, will be that of finding how much it would cost in *labour, and in the purchase of as much manure* as would accomplish the same purpose without them, and then compare the cost with that of the wheels, planks, and the open bottoms of the folds.

That the produce would not repay the cost on such soils, is proved from the fact that it is not done. In the absence of practical information on the subject of open bottomed cotes, it is only needful to take a mind's-eye view of two sheep, or two flocks, one of them well lodged, and protected alike from the bad effects of damp lying, wind, and rain; and the other on outside lodging, and exposed to all the evil consequences of such treatment. But supposing all that has been proposed to be done on poor, cold, worn out tillage lands, by means of cotes, it would be only little when compared with the avoiding of the rot on pasture lands.

The subject of the rot is an important one to the farmer, and landowner, and the public at large; and sufficiently important to induce them to reflect upon it, both in relation to expense, and to the health of the sheep. Mutton affected with the rot, is not allowed to be exposed for sale in France and America: and our not having a similar law is a great injustice to the middle and working classes who are the consumers of it. It affords no little satisfaction, to be able to speak on this subject with a degree of satisfaction which does not fall to the lot of many persons to do; a confidence confirmed by many year's experience, and in a manner that could not have been much more satisfactory had my various expedients been adopted as so many experiments, and which I will relate as briefly as possible. In doing this I trust it will be shown, that sheep may be kept sound on those soils to which allusion has been made so frequently, and effected by supplying food in cotes or in folds in wet weather, or when grass is in a luxuriant state, as on the driest soils.

The neighbourhood in which I lived in early life, consists partly of sand, on which the flock could never be affected by the rot, and another part consists of clay, clayey loam, and black sand, the latter resting upon strata of all kinds of clay of different degrees of tenacity, and sufficiently impervious to water to cause the surface to be wet, too wet for sheep during the greater part of the year, and on which the rot would be communicated with as much certainty, as the other portion, which is the smaller, would preserve them sound.

On each side of the parish are extensive tracts in which scarcely a sheep is kept. Being so disadvantageously situated, with a small portion of sound land, and a large portion of unsound land the temptation to keep sheep is too great at all times to be fully resisted. More than half the farmers in the village in which I was born kept no sheep at all, and my father was among them: but when I was about sixteen years of age, my father allowed me to try a score of ewes. I had scarcely had them a week when one of my neighbours began to inquire, if I 'had engaged a doctor, the price of fallen wool, &c. &c.;' which was a species of annoyance I had not anticipated. It however made me more careful than I might otherwise have been, well knowing that if the sheep died of the rot, I should be still more annoyed; and I attribute my success to the caution thus occasioned in my mind. I continued this practice for ten years, when I removed to an adjoining parish, where the danger was, if possible, still greater.

The autumn of 1809 was very damp and foggy, so that frequently the grass was not dry for more than a few hours in the middle of the day. I therefore appointed a boy to attend entirely on the sheep, with instructions to remove them from the lower to the higher ground when the grass began to wet his shoes. But I could soon perceive a disinclination to attend to my instructions, and on inquiry, I found that my neighbours had annoyed him, by asking him if he were training his flock for the Doncaster races, and by other jibes which their rustic wit suggested. Having had the same kind of annoyance myself, I could easily sympathise with the boy; and reconciled him to the matter by assuring him that in a few months, he would be able to return their jibes. One person in particular, whose land was separated from mine only by a fence; but he had twice the quantity I had of sound land; and yet he lost *the whole of his flock consisting of a hundred and fifty*, *except about a dozen*, the wool of which dropped off them in the following March. In proof of the soundness of my sheep, I reared *a hundred and seventy-seven lambs from a hundred and thirty ewes*, and the butcher is still living to whom I sold the ewes the autumn following, which was just twelve months after the time I bought them.

Although some individuals in similar situations may benefit by my example, my principal object in relating these incidents, is that of showing, that sheep may be kept sound under still more unfavourable circumstances in the nature of the land, and in situations where there is no dry soil, or what is called sound land: and having shown that grass on rotting ground may be eaten by sheep, when the grass is dry, or when not wet with rain or dew, it will be seen from these, that something has been done already towards attaining the great object set before us. It should be also borne in mind, that the sheep were seldom on the lower ground, longer than while they satisfied their hunger. And from hence we may infer the great importance of folding the sheep—and of soiling as means of avoiding the the rot. It is true the sheep had some grass from a dry soil, but it was poor in quality, and small in quantity: and in proof that they were not over fed, as soon as they saw the gate opened, they would hurry out as quickly as they would from a fold on fallow after a whole night's confinement: and in confirmation of the foregoing statement, I may add that the same butcher generally purchased the sheep of previous years; yet I never heard any complaint of unsoundness, either from him or any other purchaser.

It is also worthy of remark, that the person of whom I purchased one hundred of the hundred and thirty ewes alluded to, on the same day, sold a considerable number of sheep all bred on the same kind of ground, to different farmers, and that most of those sheep died of the rot, having been affected soon after they were sold, insomuch that the farmers who had bought fancied that the sheep had been unsound before they were sold,* and some of them called upon the man to refund the money: but on inquiring of me about the condition of my flock, and on being told that I never had any in better health, he said, " Then you have saved me from utter ruin:" and on making my case known, he had no further trouble: and let me add, as there are so many living witnesses, and especially the butcher, who could fully attest the truth of my statement, the thing admits of no reasonable doubt.

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* Heavy dews were then prevailing, and they continued for several weeks.

Although I have the evidence of nearly twenty years practice, in proof that the same herbage which communicates the rot, when overcharged with rain or dew, does not do so when dry; it may not be amiss to add that all the rotting ground I ever occupied was of inferior quality. It is also important to bear in mind, that I always had some perfectly dry sound ground to retire unto in cases of emergency, although but small in quantity; and that I availed myself of that advantage to the uttermost. But there are thousands of farmers who have not a single acre of sound land.

I offer these remarks under an impression, that the rot is induced by the combined influence of taking into the stomach too large a quantity of watery fluid with the food, and while thus saturated, by the change which the sap undergoes, and which is so injurious to the health of the sheep. This change, if not entirely, is in a great degree occasioned by the nature of the soil, or otherwise the same effects would be produced by wet on every soil; these causes, and that of *damp lying*, are the most common, and perhaps, the only causes of the rot in sheep.

I am now still more convinced than formerly, that the rot may be as completely avoided by means of dry lodging, and by abstaining from the use of grass wet with dew or rain; and by supplying the sheep with turnips, mangel-wurzel, and cabbage in winter, and with mown grass, clover, and tares in summer.

Substantial evidence from authorities of high repute which have been already adduced, will serve to corroborate my statements, relating to the application of ashes, pulverization, turnips, manure of sheep, and profit arising from the sheep on the system proposed: authorities on the advantages of soiling are so well known already, that it would be unnecessary to repeat them, unless for the information of such persons who may hereafter become directly interested in that subject, and who are not at present versed in such affairs.

WAGES.—As the system proposed is to be carried into effect chiefly by means of manual labour, the subject of wages must demand our special regard. But although the subject of wages must be one of vast importance to nine-tenths of those persons who are immediately interested in the system, namely, the working people; that will not operate against the *system*, inasmuch as considerably higher prices may be given, than we have supposed, and an ample profit still remain for the farmer and the landowner.

The estimates we have given are intended to apply to soils of a medium character. It is not necessary, therefore, to add much to what we have already advanced on the subject of wages, either on account of the labourer himself, or on that of the farmer, or the owner of the land. Every one ought to profit by the system, according to the order in which every such system ought to benefit society, which is, first, the labourer, secondly, the farmer, thirdly, the landowner, and fourthly, the public at large.

" SPADE HUSBANDRY—It is proved by the trial now giving to spade husbandry by the most respectable agriculturists in the neighbourhood of Eastbourne, *that digging land is cheaper than ploughing it.* They complied with the petition of ten surplus labourers for this work at *twenty shillings* per acre,* which is fully equal to *three times ploughing*, which costs thirty shillings per acre. May we not, therefore, hope that future arrangements will be made by these and other agriculturists to continue the system of digging, which will occupy the surplus labourers, and lessen the number of horses."—*Sussex Advertiser, January*, 1836.

The landowners, and the working people of all classes, ought to be the first to embrace such a system; but if they should delay to do it, it will very soon be forced upon them *by the combined effect of machinery and augmented capital.* All parties, however divided upon other questions, agree on the

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[*] One hundred per cent. less than it ought to have been.

advantages of furnishing ample employment for the working classes of society; *and if they were equally unanimous about the question of* REMUNERATION, *nine-tenths of all our public grievances would quickly cease.*

On the subject of furnishing employment to farm labourers, the Editor of the *Times* has very truly said:—"The landlord, indulgent to his tenantry in other respects, need only lower his rent by so much as is necessary for the reasonable remuneration of a sufficient number of labourers on every farm, *and add a little patch of land to every cottage in which there may be an industrious labourer: himself will be the ultimate gainer.* And why should he not insist upon the full complement of labourers to every farm? *In how many leases is it made a condition throughout England, that a flock of sheep shall be kept on each farm? und if it be allowable to stipulate for the brute herd, for* FERTILIZING *the land, surely it is permissible to require a sufficient number of* WELL-FED *labourers for its cultivation.*"

Should the head of any labouring family, in perusing these pages, conceive that I have not charged enough for the labour, I must beg that he will keep in mind the advantages he will derive from the constant assistance of his wife and children, and his* aged parents, in the lighter part of the work; for to them much of the work is well adapted, and that they will not work by the day at low wages, but by the piece, as stated in the estimates; all well fed, and clothed, and lodged, and breathing a pure air. Let him only compare such a condition with that of being cooped up in close workshops, earning about a penny an hour, which is the case with hand-loom weavers, and in those of many other occupations, and with that of a working farmer earning about twopence an hour, and more than half of his family *unemployed for more than six months in the year*. He may also compare the earnings of himself and family, with what he has upon an average received during the last twenty-five years. A more interesting sight could hardly meet the eye of the philanthropist, than that of an old man, surrounded by half-a-dozen of his grandchildren with rakes and hoes adapted to their strength, contrasted with that of four horses harnessed to a heavy drag, with a man and a lad in attendance.

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* It is impossible, strange as it may appear to the uninitiated in such matters, that the farmer, aided even as he is by animal and mechanical power, can accomplish so effectually that which will be done by the YOUNG AND THE AGED—such as are almost useless in the ordinary operations of farming. In this particular, the advantages (aided as they will be, in a very superior degree, by *atmospheric influence*) over the heavy drags, harrows, and rollers, &c. are as great, as the new machinery used in spinning and weaving, are over the old modes.

As to the expense of digging, I have put down from ten to fifteen shillings an acre *above the average price*. I ought not, therefore, to be charged with endeavouring to show the advantages of my system at the expense of the working man. Should I have erred on the important article of wages, more may may be given, and such profits still remain as will enable the employer to act upon that Scripture maxim,—"The husbandman must first be partaker of the fruits."

The impetus which my system will give to manual labour, will place the working classes in a situation which would, under ordinary circumstances, have required the lapse of many ages to accomplish. If diligently pursued, they may, in a little while, regain all they have lost by the too rapid introduction of machinery, and that without the aid of the large capitalists.

From this, and other observations, it may be conceived that I am opposed to the use of machinery: but that is entirely unfounded; and I think it right to state, that I am, with many others, of opinion, that machinery ought to be made to operate in favour of the working classes, and not against them. If before the introduction of steam power into our manufactories, it required ten hours labour per day to supply the market, and with the aid of steam the same quantity can be supplied by the labour of eight hours a day, the labourers, of course, ought only to perform eight hours of labour, and to be as well paid for it as if they worked ten hours: and it would be much better to do so, than to work fifteen or sixteen hours a day, during one part of the year, and in another part to have no employment all.

The amount of wages should always be such as would enable every one, the aged, the infirm, and the infant only excepted, to support himself, and to command the common necessaries of life: and, in that case, the home market, for agricultural produce, would be almost doubled, and for manufactured goods, incomparably more: and the home market is as much superior to the foreign market, as the British market is now to what it was a century ago. But all that we have here proposed, cannot be done until some effectual means are employed to furnish full and profitable labour, and of preventing the market from being overstocked by inanimate power.

These important considerations ought always to induce the employers of manual labourers, and the manufacturers especially, to take the subject of wages into their most serious consideration, knowing, as they do, that a moderate profit on the increase of the home market, with a reduction of the poors' rate, would far exceed the profits on the *amount of goods exported.* Those manufacturers, therefore, who have laid out the greatest capital in machinery, ought to be the first in the adoption of any measure that would improve the market at home, and would at the same time relieve such poors'-rate payers, as have not profited by them.

Only let this principle be acted upon, and the extension of machinery will be hailed as a public blessing, and as the greatest public blessing of these modern times; and instead of the working classes being opposed to machinery, they will be the first to hail its progress in the world. Difficult as this task of regulating supply to the demand may appear on the part of the manufacturer, it is easy, as compared with that which the agriculturist has to contend with, the effects of seasons. To accomplish his object he can only change his system, while the manufacturer can either stop or so diminish his operations, as to accomplish his object with certainty.

Having shown that the working classes will have the fairest opportunity of improving their own condition, I will, in concluding this part of my argument, again advert to those persons who occupy the next station in society, that is, persons in a little way of business, and especially small farmers. While we were treating the subject of trades-people in a small way, we omitted to mention the case of small farmers; and our omission may have induced the reader to suppose that we considered them unable to extend their business whenever opportunity might offer. But I am satisfied they would be able, and I could give many examples in support of my opinion, collected by me since the discovery of the principle proposed, yet I would rather appeal to the authority of other persons, and adduce such authorities as are of recent date, and which relate to that part of the United Kingdom in which such examples are the least to be expected.

"The middling and even small farmers in *Ireland* have got a great deal of ready money in small sums, which they hoard up, for the want of the means of employing it; these persons would take more land if they could obtain it whereon to employ their capital. The anxiety of the Irish people to obtain the use of land, their industry in the cultivation of it, and their means of stocking limited portions of it, are notorious."—*Second Report on the Railroads of Ireland.*

But the same may be said of the same class of people in every part of Great Britain. As to the tradesmen already alluded to, it may be said that persons unacquainted with agricultural affairs cannot expect to succeed in such occupations, and that at such occupations mechanics are not able to earn a livelihood. But in reply it may be said, that although they will have something to learn, so will the farmer himself in the execution of my plan. In preparing the ground, the master tradesman* and his men will be almost on an equal footing with the farmer. So far, therefore, from tradesmen not being able to work my system profitably, they may, in *connexion with their other business, work it to great advantage.*

Indeed the principal disadvantage, that the tradesman would labour under, would be the buying and selling of his stock, a difficulty as easily overcome, until knowledge is acquired by practice, as that of buying and selling stock of another kind in 'Change Alley. This knowledge acquired he would be nearly on a par with the mere tillage farmer, and as to the digging and other operative departments connected with preparing the soil for seed, there is nothing to learn that a city mechanic would not acquire in a week.

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* Shoemakers for instance. A very large proportion of the common shoes with which London, and probably other large towns are supplied, are made at, and in the neighbourhood of Northampton; the leather cut out and sent to these places. Why could not they move to the districts where poor land can be had? As there is poor land to be had, at a very low price in every corner of the kingdom, members of such societies as just alluded to ought to look out for it, as keenly as they would for a location in Australia. Having incidentally mentioned Australia, I will here observe, that the WORKING MEN (AND WOMEN TOO), should as a means of keeping possession of *their property* (labour), have their minds as steadily fixed upon *new countries*, as the helmsman has to the "winds eye."

The greatest difficulty will be in learning the art of flax dressing, and in this, as in other matters, the mechanic would be just as forward, or rather he would have no more to learn than about ninety-nine out of every hundred farmers, for, *unfortunately*, too much of this department of useful rural economy, has been given to the *Russian* peasant, and for reasons previously stated, reasons which will not hereafter exist.

As to the requisite knowledge of stock, the tradesman and working man will derive much advantage, assisted by close observation, from tables, of live and dead weight of stock, compiled and published by Mr. Layton Cook, Land Surveyor, Pall Mall, London. A person might be an excellent judge of stock as regards symmetry, quality of wool, and a disposition to fatten, who would know nothing about weight, if he had not paid attention to the subject, and then he only acquires the weight of the living by comparison with the living. A person would acquire more knowledge in this particular in a month, by assisting in a slaughter-house, than he would in a year in the ordinary business of farming. The knowledge, as to weight which working men acquire of pigs, by comparing the weight of their own, with that of their neighbours, which they have an opportunity of doing both before and after the pigs are killed, justifies the above observations.

I do not maintain, that an inexperienced person with the same amount of capital, and on the same land, and confined entirely to his farm, would in the first instance, realize as much profit as would be realized by an experienced farmer; but I would venture to assert, that if the tradesmen could connect his own business with his farm, allowing his men to work a few hours of the day in the field, as is the practice in an academy in Murray County, Kentucky, even at an extra price, he would, in that case, realize a larger profit than the farmer. And it would satisfy and encourage all such persons to know that Tull, the father of our present system of agriculture, was not himself brought up to the business of a farmer. But if it can be shown that these new farmers, on my system, may conduct their business with less loss of stock, either by starvation or the rot, it will show that he cannot be so unprepared for the business of farming, as the farmer himself was a little while ago.

My observations on mechanics and their employers, have been intended to apply to those whose business has been superseded by machinery, and who could not find any other employment for themselves or their capital. Should it be said there is a great surplus of agricultural labourers, I would answer that the surplus has not been occasioned by the introduction of machinery into agriculture, but because the land on which to operate has been exhausted, or, at all events, *that portion which is capable of being cultivated to advantage;* and this is clearly proved by the few enclosures that have taken place for the last five and twenty years.

Some things, which on a superficial view appear exceedingly plain, become very difficult on a minute examination, and *vice versa.* The subject before us, in relation to such persons as are unacquainted with farming, is one of the latter kind, which, probably arises from there having been so much said of late, and very justly too, on the subject of improvement in the breed of cattle and sheep, and the great skill and spirit called forth into action thereby. This may be the case, in relation to those persons who so laudably devote their time and property to the improvement of the stock, but will not apply so generally to those persons who as carefully guard against their stock degenerating, as they are indifferent about its improvement. These discussions, however, have assisted in raising the agriculturist to an eminence not previously contemplated in this country.

This public improvement, and the consequent reputation, induce the rich to embark in farming, while it produces the opposite effect on others: it is, therefore, only by taking a medium estimate, that any fair calculations can be made, in regard to the probable success of such persons in that system of farming, as have been just alluded to. Now they will not need the refined skill of the British breeder and improver of sheep, in regard to symmetry of form, and disposition to fatten, nor are such persons to direct their attention exclusively to the quality of the wool, as in Saxony, but merely to select such stock in the public market as may combine these properties in the greatest degree. This is the business of the ordinary grazier; and the required information is at all times to be had, so that having obtained the requisite stock, there will be no difficulty in the management of it.

And as to the tillage department in the plan proposed, in consequence of the high condition in which the land may be always maintained, it will be always less difficult to manage it, than to manage land in an *impoverished condition.*

Should these new farmers succeed in the enriching of their lands, and that to a degree beyond what the best practical farmers have contemplated, and, at the same time, effect an improvement in the wool, and avoid the rot, and also realize more profit, it may be fairly maintained, that if they are not better farmers, they have accomplished more than any of those persons who have lived before them. We shall conclude this section with the following quotation:—

"There are few things more flattering to mankind, than to be shewn, by practical example, the fertility of the human mind: it is a noble spectacle for us to watch an individual turning all nature to his uses, forcing where she does not yield them spontaneously, and by the arts of civilization, directing into the channels best adapted to administer to his wants: the struggle is noble."—*Westminster Review, January*, 1830, *p.* 104.

SECTION V.

CONCLUSION.

From the foregoing statements of the quantity of land in Great Britain, now in a dormant but virgin state, and presenting a plentiful supply of manure, with a surplus population to bring it into tillage, a conclusion may probably be drawn that a glut of butcher's meat will be the result, I will, therefore, notice a variety of causes, which, I think, will more probably prevent than accelerate such a consequence, at least for many years to come.

And First,—All the improvements herein contemplated, are by means of sheep, the annual increase of which cannot, like vegetable produce, be augmented by any artificial means.

Secondly,—The large quantity of waste lands, poor enclosed pasture, and in ley, amounting, on the whole, to more than one-half of the soil in Great Britain, the immense number of sheep it will require to stock such a quantity of land, and the desire which the owners of such land will have to improve it, will keep a vast number out of the market annually, *until the whole shall be completely stocked.*

Thirdly,—The cultivation of a sufficient quantity of land to supply all the holding stock which are at present not allowed any other food in winter than grass and straw, will create such a demand for labour, as to cause a much larger quantity of meat to be consumed by the working class, than is now consumed, and that in consequence of their improved condition.

Fourthly,—The immense quantity of butcher's meat already required, more than is now produced, to furnish an adequate supply to the whole of the working population, and which will be consumed when their condition is improved, is itself a farther reason for believing that a glut cannot take place very soon, if it should ever take place at all.*

Fifthly,—In addition to the augmented quantity of the meat required, in consequence of the improved condition of the millions now living, we may add the annual increase of from three to four hundred thousand persons every year, which by the time all the waste lands are in full cultivation, will, probably, have augmented to a threefold increase, so that the population of that period may still be equal to the supply.

Sixthly,—The convertibility of all soils to which the proposed system is adapted, will become another source of prevention to a glut of butcher's meat, for, enriched as the soils will then become, any other kind of produce may be raised to which the climate is adapted.

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* Overstocked markets arising from temporary causes will not amount to a national glut; but a produce that will exceed an average of half a pound per day for every person.

How far these calculations may prove correct, must be left to time, and circumstances, and seasons to show, over which mankind have no control. Amongst other matters over which Englishmen have heretofore *had no control,* we may mention that of *not being able to supply* ONE-HALF *of the quantity of animal food required.*

Therefore, before the farmer makes any important changes in his business, he will do well to ascertain the cause of an over-stocked market of butcher's meat, for sudden depressions are more frequent *from a want of purchasers,* than from any sudden increase of the supply; in fact, there cannot, according to our laws, be any increase by means of importation, nor from fruitful seasons, as with grain. I am aware that there are often over-stocked markets of live stock in the autumn, but that is always occasioned by a scarcity of winter food, and not from any sudden increase of stock, as no such thing can possibly take place.

This want of winter food will but seldom occur in future; the farmers, therefore, must carefully watch the supply and the demand of cottons, woollens, linen, and hardware, rather than the supply and demand of butcher's meat, for whenever there is an *excess* of machine manufactured goods, for any considerable time, it will cause a glut in the cattle market, through a decrease of consumption. On a discussion upon this subject, his Grace the Duke of Wellington very justly remarked, that a stock of goods can be manufactured in one year, that will serve for two years of consumption, or words to that effect; and a mere reference to our importations of wool, tallow, cheese, butter, and *sugar, which may now be produced* AT HOME, will induce a similar conclusion as to those articles. The only means of extending a home market to its utmost limits, so as to meet every increase of home produce, are that of furnishing employment, and that of giving such amount of wages, as will enable the working classes to purchase the produce; always bearing in mind that the population has THE LEAD of produce, and more especially in that of butcher's meat.

This would be the most humane disposal of labour, and of the fruits of the earth, and it would ultimately be found to be *the most profitable*, and is now sufficiently notorious that the present system has been tried and has failed. The system proposed would save a very large proportion of the many millions yearly paid in poor's rates, and a still larger sum supposed to be given in private charity; it would save many heart-rendings in receivers and contributors, would save no small sum of public money in the prosecution of those miserable beings who break the laws of the land.*

I will again repeat, that in consequence of the facility with which pasture lands may now be broken up, and laid down again, if, on the first appearance of a glut of meat, (which cannot happen in Great Britain, if the working people have proper wages,) a few farmers in every parish in the kingdom were to break up a small portion of their pasture lands, much of the loss that would be otherwise sustained, might be avoided. And lest it should be said, that this would aggravate the evil, rather than prevent it, by the forcing of stock into the market which such broken up land had previously supported, I would observe, that the same plan might be resorted to for a while, which is now resorted to from necessity, and which is that of supplying the holding stock with only about half as much as they would eat. This plan is systematically followed in Saxony, as a means of obtaining extremely fine wool. Working people also, in all stations, are obliged to submit to the same regimen, and that inconvenience will continue to exist, until a better *system of supply and demand* shall be adopted, both in relation to agriculture and to manufacture.

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* Could not a large portion of these unfortunate creatures be better disposed of in the Hebrides, than sending them to New South Wales, or the West Indies, as lately proposed.

It will be perceived that the *convertibility* of all kinds of soil, will greatly prevent a glut of any particular kind of produce, and will, of consequence, be productive of the greatest benefits to all parties. In accomplishing this purpose, the cultivation of hemp and flax will become the most important means. But it is still more important to remember, that the turnip, the cabbage, &c., must act, in the first instance, as preparatives for flax and hemp, and afterward as restoratives, when those non-manure producing, yet highly valuable productions have done their very worst, thereby dispelling every fear, and removing all objections to the scourging of the land, by the growing of flax, and the tiring of the land, by the taking of two many crops of turnips in succession.

Hemp and flax so far exceed all other British produce, as a means of providing profitable employment for the labourer, that their cultivation ought to be increased to an extent that would meet all exigencies, and, at the same time, counteract, in some degree, the evils arising out of over cultivation of other farm produce. Should a glut of grain not be kept down by these and other means alluded to, the cultivation of the beet-root for SUGAR may be resorted to, and that it will be both more profitable and more humane to do this, than of raising sugar in the West Indies, by the labour of kidnapped Africans, will not be disputed.

It is worthy of remark, that those sections both of this and other countries which are best adapted in regard to *climate* to the production of cattle food, as well as of grass and flax, are the least adapted to the production of wheat, and to a great extent not adapted to other grain; which is more explicitly noticed under the head of Boundary Line at pages 170, 1, 2. This observation will apply to Dartmoor, Exmoor, Wales, the North of England, and Scotland; where there are such large tracts of peat in climates too damp for grain.

It is a coincidence as singular as it is interesting, that so wide a field, and one so profitable for the employment of the best energies of mankind, should at the same time be opened to the important productions of the earth, which are so widely dissimilar in their nature and their uses, as are those of flax and hemp, turnips and cabbage; and especially, that they should require all the time, and no more, to bring them to maturity, that our climate has given to those tracts of land; and which now lie in a comparatively useless state.

Were all the sheep and cattle removed from the rich grazing lands, as quickly as these heaths and moors could be made to supply them with food, and the rich lands appropriated to the producing of beet-root for sugar, the home market would be fully supplied with that commodity in three years.

Having stated that one-fourth of the poor soils might be appropriated to the growing of hemp and flax, it will no doubt be considered that I mean those productions be taken in rotation with turnips: and if so, I shall be told, and very justly too, that the higher parts of mountain grounds in the North of England, and of Scotland, are too bleak and cold for hemp and flax: I will therefore take this opportunity of stating, that what I have said may be accomplished without taking either hemp or flax after turnips, and without being obliged to ascend to an altitude that would be either inconvenient to the labourer, or would incur any risk from too low a temperature, or from high winds; and effected by selecting the best soils and the most sheltered situations. As to the supply of manure, it may be obtained in abundance by the folding of sheep when fed on turnips in the adjoining grounds, and without the trouble and labour to the animal of travelling three or four miles, as is the case in many parts of England. And as to the notion that the land would *tire*, with such means of applying manure, by repeating the same kind of exhausting produce, it is only necessary to refer to the hemp gardens in the various parts of England, in which it is raised from year to year for a great length of time.

"Hemp greatly impoverishes the ground, so that the crop should not be repeated on the same land. *It may, however, be grown on the same land for many years by manuring annually.* If it stands for seed, it is on all hands acknowledged to be an exhausting crop; but if it be reaped without seed, it is, on the contrary, supposed by many to improve the land." —*Treatise on Hemp, p.* 29, *by Robert Wissett, Esq., F.R. and A.A., with an Appendix by the Right Hon. Lord Somerville.*

It has been shown already at p. 103 that turnips will thrive at a much higher altitude than grain, and I have also described a mode of supplying manure to the lower grounds for the purpose of raising hemp and flax: and I will now add that the same means may be resorted to for improving pasture at a *higher altitude* than that on which the turnip itself will thrive; so that in the course of time, and when the increase of population shall require it, every acre of ground, every ACCESSIBLE yard on which a sheep can repose, so situated and covered with only two or three inches of earth or peat, may be greatly improved.

While on the subject of hilly and mountainous lands, which are as ill-adapted to tillage by animal labour, as to the production of grain, it may not be amiss to notice the advantage that will arise from this extreme altitude: the turnip will be preserved much longer in the spring of the year than at a milder temperature; for it is well known that a good covering of snow is the best security to this root: indeed, it will be in good preservation until the time of *transplanting* arrives; so that in these situations, this plant will occupy one-fourth of the ground all the year round, the same spot on which their food had been preserved through the winter and spring, will be the first to which the sheep will resort in the hot months of June and July. Instead, therefore, of travelling four or five hundred miles, as the sheep do in their marches to and from the low and warm winter grounds of Estramadura to the mountains of Castile every spring and autumn, as well in search of food as for a temperate climate, the journey may be performed in such situations in Great Britain, with greater ease in one hour, than in thirty days in the kingdom of Spain; and indeed, in less than half the time, which in many instances is daily occupied in England in travelling to and from the pasture to the fold upon some *distant fallow*, and with the additional inconvenience of leaving a large portion of their manure on the way. Nothing can be more evident, than that those ragged and dingy-looking regions, under a new treatment, will exchange their present gloomy dress for that of verdant green which of all others is the most agreeable; and more so, when enlivened by the groups of sportful lambs, as it then will be, and not by one to every two or three acres, but by half a dozen to every acre. At the same time, the climate of the whole country will be improved, by being made drier; for much of the rising steam from the peat bogs will be dissipated thereby.

It has been shown, that a climate among these mountains, may be secured to the sheep by means of sheep cotes adapted to their health as well in England as in the climates of Saxony and Spain. In the latter country, to the expense of providing *houses* may be added those which are incurred in their periodical migrations.

If the plan proposed were carried into effect to half the extent to which it will be capable of being carried, Scotland, as an entire country, would become the first, and the richest grazing country in Europe, occasioned partly by its irregular and mountainous surface, which prevents its being tilled by animal power, and partly from the humidity of its Atmosphere, and its consequent unsuitableness for the production of grain: for it so happens, that in the same degree that dampness of climate disqualifies Scotland for the growing of grain, it improves it as a grazing country, not only for winter food, but also for summer food, the grass. In this observation concerning grass, I do not intend to convey any idea that summer pasture on poor lands will ever possess the fattening properties of that on rich grazing lands. This defect will be more, far more, than balanced by the winter food.

From the preceding statements it will be perceived, that nothing hereafter will be lost in those situations in consequence of the shortness of the summer season, provided it be not less than of four months duration; neither as regards the seeds, the natural grasses, nor flax, which are, as a whole, so admirably adapted for the support of sheep, and for the full employment of the population. There can be but little doubt as to the success that will attend the cultivation of those products, in these romantic, and as yet, comparitively uninhabited gloomy regions.

In relation to the raising of such a kind of produce as will fertilize the soil, and the supplying a profitable and full employment for the labouring classes of society, the system here proposed will be found to operate with the exactitude of a mechanical evolution, and with all the certainty of a mathematical proof: there will also be the following coincidence of agreement between the kinds of produce intended to be raised thereby, namely, grass and turnips; the one a natural and the other an artificial produce; the one containing summer, and the other winter food: with this additional coincidence, that grass and turnips will so harmonize together that the grass will be on the decline exactly as the turnip will begin to flourish, and that the turnip when only half arrived to its maturity, will, by the stripping of its leaves, assist the grass in its declining state; and these coincidences are sufficient to convince any intelligent and philosophic mind, that the system by its harmony with nature, asserts its own authority and justifies its claims on the patronage of mankind. There is likewise this advantage in the system now proposed; which is, that the owners and the occupiers of the most sterile soils will be in the actual possession of a large quantity of stock of the exact machinery required, I mean of sheep: and to all these advantages may be added those which will arise out of the customs of the Highlanders in their domestic manufacture, which will be made evident by the following extract from the Agricultural Report of the County of Inverness, at page 316;—

"The domestic manufacture of this County is very considerable, because upwards of *sixty* thousand of the inhabitants, out of a population of seventy-four thousand, may be said to be clothed by their *home-spun* and home-wrought stuffs of various kinds, excepting bonnets, handkerchiefs, and a few more articles for female, or Sunday's attire.

"The housewives, and their daughters, and servant-maids, are more industrious than one could suppose in a country where the pastoral habits and employments still continue so much to prevail. Their cloths are woven by the country weavers, and dressed by the dyers in the neighbourhood. Their tartans and plaids are universally admired for fineness of fabric, brilliancy of colours, and the taste displayed in the variety of sets or patterns. This display of ingenuity and industry, is by no means confined to the common people." Evidence enough has been already given, and yet still farther proof will be afforded of the fact, that *flax* to any extent may be cultivated in the Highlands; so that the enlargement of the domestic manufacture of those elevated regions may be easily effected, whenever the people may turn their attention to that subject.

Had the Highlands of Scotland continued as formerly (about fifty years ago) to be stocked with black cattle, the foregoing observations would not have applied. Taking therefore this circumstance into our consideration, and taking that of the recent introduction of turnip cultivation, together with the fact that Great Britain, for reasons before stated, *is not able to furnish a supply of butchers' meat that is adequate to the demand*; it will be seen that this discovery could not have been made at a much earlier period, with so much advantage to the public, or with so many inducements to the adoption of the system proposed. But no class of society will reap more advantages from it (the owners of such soils only excepted) than the manufacturer, as it will furnish the means of giving employment to the thousands of hands that are always liable to be thrown out of employ by *improvements* in machinery, and its consequent extension: but, what is still more important to such persons, is the *market it will open for their goods*, and especially as their foreign trade is acknowledged to be " rapidly on the decline."

It has been observed already, that Scotland may become the richest grazing country in all Europe. The observation was then made in connection with the fact, of the impossibility of tilling a great part of it by animal power, and with the fact that the climate is too damp for the growing of grain with equal success with the production of butcher's meat and wool, and consequently cannot be reduced to barrenness by the tilling for grain. *That the best grazing lands will then be forced into tillage* on the first appearance of a permanent glut of butcher's meat, is as certain a consequence, *as that the Highlands of Scotland will then become almost as valuable as the richest grazing lands in England.*

Although my scheme is a very simple one, and does not require the aid of any new invention to put it in action; yet much of its success in *Scot-*

land will depend upon the application of a comparatively new invention, namely, the steam engine, as a power to convey the produce to market, thereby affording additional evidence that the successful operation of one discovery will be always dependant on some other development of the human powers.

Much of what we have said of the Highlands may be said of all peat soils, and of other *high lying* lands, both in this and many other countries. Nor will those lands which are now the most barren, or the most difficult of access by ordinary means, be the last on which the the best effects will be produced; for it so happens, that such lands may be thereby brought into cultivation at the least expense, in consequence of their requiring but a small outlay in drainage, and much less than level lands: although I have not given to the subject of drainage all that attention it may seem to merit, because I have regarded drainage as being so obviously necessary.

Having said so much upon the improvement of the Highlands of Scotland, with scarcely an allusion to the Bogs of Ireland, it may be thought that I had overlooked that subject. My silence has however been the consequence of my knowing, that the Highlands have been considered to be as much without the reach of all profitable cultivation, as the Bogs and Moors of Ireland have been thought to be within it; and with a population trained to the use of the spade, and always ready to be actively employed therein.

When the Mountains, Moors, and Bogs of Ireland shall be brought into cultivation, the "bog trotters," as they are sarcastically called, will then have a liberal share of the comforts of life, provided only that their allowance shall be in proportion to the *increase* of the produce: and when that is done, all will then be accomplished which could be reasonably desired. Such a public measure would produce as great a change in the appearance of the people, as it would do on the face of the country, and would maintain a balance between the population and the produce, and would equally prevent a glut, and produce a plenty.

If therefore to the duty of ascertaining the state of the crops, were added, that of prohibiting all export of produce in every parish and county, and *country* at large, without first proving that a sufficient quantity *was consumed at* HOME; such a measure would do more to prevent a glut, reduce the poors' rates, and allay all popular disensions, than any thing else that could be done, especially in Ireland.

As to raising stock upon such soils in an unimproved state, that is, skin, bones, and wool, it is what a house carpenter would call "getting up the carcass," leaving the finishing department to other and wealthier (lands) persons.

But being aware that these statements as to the relative value of rich and poor lands, may seem to the *sceptical* (namely, the over wise persons destitute of all practical knowledge, and who, above all others, are the most *ready in passing judgment*) to cast a doubt upon my system, I may again remark that there are limits to the power of production in the richest soils, beyond which mankind can never pass, with success, and the poor soils just alluded to, may arrive at that point, in the production of *winter cattle food.* From the cattle food produced by each of those two sorts, that is, rich and poor lands, let the several expenses of RENT *and cultivation* be deducted, and it will be found that the surplus, which is the profit, *will be in favour of the poor soils.*

In referring to the moors and mountains, the subject of *climate* becomes a matter of deep interest. A damp climate is suited to the turnip, which is proved by the fact that it succeeds better in Scotland, and even there in a greater altitude, than in the south of England; and it is equally clear, that in the climate which is best adapted to this *manure-making plant,* wheat does not mature at all, whereas this plant appears to be the most out of all danger from the vicissitudes of the seasons. It follows, therefore, that at every succeeding stage southward beyond the line, where these two all-important productions arrive at equal perfection, when growing side by side, the climate becomes more favourable for wheat, and the same may be said of the north in relation to the turnip.

Although the tracing out of the BOUNDARY LINE, with uniform exactitude, would be a vain attempt, inasmuch as it must vary with the varying seasons, yet a tolerably correct conclusion may be obtained by taking an average of the seasons. I would say that it lies somewhere about the centre of England, and that the climate for the production of wheat improves as we go southward, just in the same degree as the turnip improves to the northward. In confirmation of this, I saw excellent turnips within a little way of John O'Groats, as well as in many parts of Sutherlandshire, and that in the cold season of 1829. In crossing the Cotswolds, on my return from Scotland and Ireland in the same year, I found the turnip crop, on all the clayey soils, far below an average one, occasioned by the coldness of the season. This is a proof, in addition to thousands, that this plant thrives better in a cold damp climate, and in a pervous soil, than in an impervous soil, *thinly tilled,** although in a warmer climate ; and this would clearly show the advantages of tilling cold clayey soils as deep as would be consistent, as appears in recommending the *subsoil* to be stirred with a narrow spade.

It is worthy of notice, that mangel-wurzel is as well adapted to the south of England, to France, and indeed to Europe and North America; and if not to every part of those countries, at least to all their mountain districts, as the turnip is to the north of England; and as a supply of manure can always be obtained, it may be extensively cultivated. The large quantity of manure which that plant requires, is *now* a great bar to its cultivation, to its exclusion upon poor soils, and where artificial means cannot be resorted to with profit. From these observations, it will be seen that wheat and mangel-wurzel will be constant companions in the south, and turnips, flax, and grass in the north. Doubtless all these productions will be cultivated in every corner of the United Kingdom, although every kind will prevail according to the previous scale.

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* Many of these hills are thinly tilled from necessity, in consequence of the rock being so slightly covered.

I am aware that mangel-wurzel will be attended with the additional expense of storing,* much in the same manner that potatoes are secured against the frost; still I am convinced that, from the superior quantity per acre that will be produced, this objection will be overcome, especially in consequence of its not being so often affected by *mildew* as turnips are, particularly in the south of England. This is a question of a pecuniary nature, on which every man may judge for himself; and is as much within the means of the cottager and those of the small farmer, as those of the large farmer, it will soon, no doubt, be fully tried. I will again remark, that too much care cannot be taken in supplying a small quantity of hay to the sheep when fed on this root. It will, however, be easily perceived, that the Swedish turnip will not suffer so much in the south from heat by the plan proposed, as by the present practice.

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* Hemp is as well adapted as a covering in winter to guard against frost as flax is for thatch.

The difference of temperature on fallow and on grassy surface, is too obvious to require any comment. Moisture which falls in dew, in dry hot weather, and the most copiously when the weather is the hottest, is quickly absorbed by the parched earth, when in the state of fallow, as by a dry sponge, while it is caught by grass for the purpose of being absorbed by the thirsty and drooping leaves of the turnip. Instead; therefore, of a dry sponge-like earth being placed to receive and absorb this refreshing beverage, grass answers all the purposes of a *saturated* sponge, placed as it were for the purpose of supplying what is so important in dry hot weather, consequently less danger from mildew.

PASTURE.—On the subject of the BOUNDARY LINE, before alluded to, I may be in error, but there is another boundary line which arises from a different cause than that of climate, and in determining which I shall not be liable to err, because it is already marked out, and is strongly distinguished by figures, which is the line that separates the cultivated from the uncultivated, the profitable from the unprofitable, *the line that cuts off* THIRTY MILLIONS *of acres, consisting of what we call* PASTURE LANDS.

If to this quantity be added the poor enclosed pasture and the ley, which are classed with lands in cultivation, we shall then have considerably *more than one-half of the United Kingdom lying in a comparatively useless state, but which is capable of being made more productive than that which is already in cultivation, has been hitherto made.*

There is also a large quantity of poor land in *tillage*, almost as unprofitable as the ley, to restore or renovate which much capital must be expended, and much time lost, when compared with poor soils already in pasture, although equally poor by nature. A profit may be realized from the latter in twelve months from the commencement of the proposed operations, while the former will require FALLOWING, and that at a cost of from three to four pounds an acre, and in manure a still larger sum, in all not much short of ten pounds. I will, therefore, again repeat, that every acre of poor *pasture* land is worth more by five pounds, than land of the same quality in tillage. In pasture land, the foundation is laid to work upon, with other required materials, exactly on the spot desired; but on poor tillage lands, the turf, part as materials for ashes, and part to lie upon, has been destroyed, and to replace it would be a work of time and expense. The surface, indeed, is left, but to raise the condition of the soil up to a level with that of the old pasture, would occupy much time, and would incur a great expense.

In the brief sketch already given, a novel feature was presented, for it was therein proved, that the more there is produced, the greater will be the demand, provided the produce, or the profits thereof, be divided as therein stated; and that principle will continue in operation until every acre of land is brought into the most profitable state of fertility, and that not the waste only, but also the enclosed.

It is, however, a great satisfaction to perceive, that while this effect is in the course of production on the second great staple commodity, which is meat; the opposite effect will be produced on the first of staple produce, which is bread. The system proposed WILL SET AT LIBERTY EVERY ACRE OF THE RICHEST LAND IN THE KINGDOM, and in many other countries, for the production of grain, and that as completely as if every head of sheep and cattle were shipped off to the East Indies, where so many human beings are dying for the want of food. While making this observation, I am aware that much of Europe, excepting in *mountain districts*, is too dry for the turnip, but is not too dry for mangel-wurzel, which is so excellent a substitute, that but little inconvenience if any will arise from thence.*

This view of the subject will, no doubt, induce the tillage farmer to reflect upon the consequences of an overstocked market in grain; for, of all evils that can happen to a country, scarcity and over-abundance are the greatest. The farmer and the landowner will, however, *now* not only be better prepared to sustain the inconvenience of an over supply, than other portions of society will be for the opposite extreme, but they will be better prepared than at any former period. Although scarcely needful, I will now very briefly give two or three reasons why farm produce may in future be sold at a lower price than at present.

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* Perhaps no country on the continent of Europe, its extent considered, will derive greater advantages from this plan than *Switzerland, where pasture* and meadow lands are cultivated in a manner unequalled in any other part of the world.

First,—Because poor and inferior *tillage* lands may be made to yield twenty per cent. more than they have hitherto done.

Secondly,—Because rich pasture lands will be appropriated to tillage; and they will be as capable of yielding thirty bushels of wheat per acre, as those which are now in tillage are capable of yielding twenty.

Thirdly,—Because the worst of pasture lands will yield twenty times as much as they now do, and three times as much as the best of grazing lands.

Fourthly,—Because such a change would furnish employment to an extent that would reduce the poor's rates in rural districts from fifty to sixty per cent.

Fifthly,—Because manure will then be made on the spot where it will be most wanted, with a profit arising from the manufacturing of it, instead of having to purchase and cart it at great expense.

As to the demand, the agriculturist may dispel his

his own forebodings, by bearing in mind that it would require the annual produce of nearly one million of additional acres to supply the demands (if properly fed) of the increase of population: and whether these desirable objects are attained or not, should it at any time appear that the supply is inadequate to meet the demand, every facility to importation will be no doubt afforded: and then will be the time to call upon other countries to supply the Englishman with bread.

Should the manufacturer argue that the farmers are so tenacious in their attachment to established customs, that the demands of an increasing population will exceed the increase of produce, I would refer him to the improvements which have been made within the last half century; and not improvements which have been made in any particular department only, or merely in one section of the country, but in every part in which they have been *practicable.* And that the manufacturer will have no right to entertain such a prejudice, is sufficiently manifest by the number of persons employed, and by the produce now raised compared with any former age. This circumstance, together with the fact that *all the raw material which is available being in use,* will account for the small *increase* of employment in agriculture compared with manufacture, which, instead of being a reproach, is the highest eulogium the agriculturist can desire. Instead, therefore, of the manufacturer calling in question the skill of the British farmer, he will have reason to believe that the *supply will exceed rather than fall short of the demand*, and that this abundant supply will continue until counterbalanced by the increase of population.

The effects produced by improvements in agriculture, have been compared to belts surrounding certain counties, or the country at large. "They are equal to so much land found and added to that already in cultivation." Sir Walter Scott has taken a comprehensive view of that which has been added by Lord Townshend. Another belt of larger size was added about the same time, and one that not only encircles forty millions of acres, but which spreads itself over twenty millions, namely, artificial grasses. The merit of that discovery belongs to A. Young, whose biographer has said, "He was the first person who commenced the cultivation of artificial grasses, which he performed by collecting the seed by hand, and sowing it, although the merit of it has been unjustly claimed by others."

The system in contemplation will encircle seventy-three millions of acres; with a belt containing a surface of sixty millions of acres of land, and spread itself over above sixty millions of them.*

The manufacturing part of the community will therefore perceive that the British agriculturists will now have the means of SUPPLYING THE DEMAND, *and that on lower terms than heretofore.* If they will not act upon it, the manufacturers cannot do better than assist in accomplishing that which they themselves so much desire, especially as they will have the command of two out of the three essentials for effecting their purpose, namely, money and men in abundance; and even the third, the article of land, will be equally at their command. And it so happens, that there are large tracts of land, well adapted to the plan proposed, which are near to some of the most populous of our manufacturing districts.

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* In making this deduction, it is assumed that the 13 millions are comprised in lands that are occasionally flooded, and which cannot be brought into tillage without much risk; in lakes, tops of mountains, roads, and sites of towns, &c.

In the mean while, the British farmer will do well (as a means of avoiding a glut of grain) to cultivate such produce as will create the greatest quantity of labour, for which he will be enabled to pay a much better price than heretofore, and pay it out of the increase of the produce.

And as to the British landowner, although he may have powerful competitors in Russia, Holland, Germany, Spain, Van Dieman's Land, and South America, in regard to wool and tallow, he has not yet been alarmed as to the main produce, the body of the animal. It is therefore decidedly his interest to improve and protect the market for that species of produce, and that for the following reasons:—

First.—Because it is not an exportable commodity; and

Secondly.—If it were so, no market could be found, inasmuch as the working classes on the continent use but little animal food, and even if they did, they would still be able with the aid of my system to supply themselves therewith. I say, with the aid of my system; because it cannot be done on the present system of agriculture. France, for instance, one of the most enlightened countries in Europe *cannot now supply* ONE-FOURTH *of the quantity of animal food that her population would consume, if properly supplied.* I draw this conclusion from the fact that the population of Great Britain *is not supplied with one-half the quantity of butcher's meat that would be used if the whole were fully employed, and by that means enabled to purchase all they would require*—and that the consumption in France compared to the population in England, is only one-sixth of what is consumed in England. The British farmer and the landowner therefore having no foreign market to rely upon, must needs make a market in their own country. It is equally clear that they must accomplish that purpose by paying good wages, and by assisting the labouring classes in procuring the same by legislative meaures from all other employers of manual power. With such ample means of *supplying the demand, and that from our labour, and our own soil,* and at a lower price than heretofore, it is obvious that any interference with the corn laws is quite unnecessary.

Nothing, however, can be more clear, than, that it would be to the interest of all classes to supply as much labour as possible. It would require more than three hundred thousand persons to raise and dress as much hemp and flax as are now imported: nothing better therefore could be done, than that of cultivating hemp and flax as a means of reducing the poors' rates, and of rendering the country entirely independent of all foreign countries for the supply of those products. The cultivation of hemp and flax has not been advocated, because those articles produce no manure, which evil will be remedied by the system proposed; but the cultivation of those products will afford the best means of preparing land for the cultivation of grain; and especially wheat. Landowners would therefore do well to expunge those clauses from their leases which prohibit the growing of hemp and flax; and rather offer premiums for raising them. If every farmer were only allowed to make a slight deviation from *prescribed rotations*, many of which are injurious, as much wheat might then be raised on stubble lands, and on ley intended for oats, beans, &c., as would supply the demand until a sufficient quantity of old pasture land could be brought into tillage. For the present year (1840) much may be done in the month of March; but for such deviations, the farmer would need the permission of his landlord. To supply the demand, however, for the present, will depend more on the landlord than on the tenant. This observation has not been made hastily, but on much deliberation, and on full conviction of its truth.

If there is any truth contained in the preceding pages regarding the properties of manure made by sheep, it will occur to every one, that land, however poor by nature, may be so enriched as to render the raising of grain AS A FIRST CROP, after three or four successive crops of turnips have been taken, as being unadvisable, from the probability that it will lodge. I will even go a little farther; by stating that the land will often be too rich for flax, and that hemp should be taken as a first crop, for which the land can hardly be too rich. Taking hemp as a first crop, for reasons before stated, *will* often be done in situations *not adapted to grain.*

But lest it should be thought that these facilities and inducements should produce a glut, I will again repeat, that the improved condition of the working classes, aided by an *increase of population* will tend to counteract it, and more especially when we are to set out with such a deficiency of these productions.

There is another subject, which has been but slightly noticed, connected with supplying the staple produce, and a subject over which mankind has no control; I mean the seasons: for when the farmer casts his wheat into the ground under a hope of reaping twenty bushels on an acre, which is supposed to be near the average crop, he may possibly obtain thirty, or he may reap only thirteen. " In the year 1795, the produce of wheat in thirty parishes of Devonshire and Cornwall, was only *thirteen* bushels an acre."—*Williams on the Climate of Great Britain.*

And as to hemp and flax: lest the ghost of supposed superiority in the quality of foreign produce, should continue to haunt the popular credulity, I will venture to assure the farmer that the notion is illusive. It was proved in His Majesty's Dock Yard, at Woolwich, many years ago, that British hemp is better than any that has been imported. Whether it may arise from the heating of such foreign produce in the transit from climate, or from soil, I am not able to determine. Should it be said, that the Emperor of Russia will continue to export those commodities at a lower price than they can be produced at in our country; and that, because Russia is not burdened with taxes, and because of the *inferior mode of living*, which prevails among the poor in Russia; I would only say, in reply, *adopt the same principle as the Emperor has lately acted upon, in* PROHIBITING the export of bones. A better example could not well be desired, either as to the nature of the prohibition, or the time in which it was issued, in 1838. It enables the Emperor to export more grain, while Great Britain produces less. Should our government, therefore, prohibit the importation of hemp and flax, the Emperor would not have any just cause to complain.

It is, however, a most fortunate circumstance, that foreign bone manure may be *hereafter* dispensed with, and that without inconvenience; and so, indeed, may foreign flax and hemp, in the course of *two years*; and this is as obvious as that the prohibition of flax and hemp by importation, would be a great advantage to the whole of the working class, but more especially to the rural population of our country. The supply of such commodities by foreign countries, has gone to check the cultivation of them in our own country, insomuch that the cultivation and dressing of those articles are now but little understood, which is more especially the case in relation to the *dressing* of flax. It would, therefore, be advisable to offer premiums to the best workmen in the dressing of flax.

On the subject of improving poor soils, much has been said already, and much has been done; but, in many instances, the land has been left more sterile than it was found, and which has been for want of a regular supply of manure; and such have been the results of tilling poor, cold, and wet soils, although dry soils, still *poorer by nature*, have been rendered profitable. But that will not hereafter be the case upon such poor wet soils. If it be true, that land and labour are the real source of wealth, then will the system here proposed effect a greater improvement of the soil than has ever been effected since the art of cultivation has been practised, and consequently, when brought into general use, will produce a larger increase of wealth than has ever been effected by any system of human industry. Those persons who may regard these predictions as exaggerated, may do well to compare them with what Sir Walter Scott has said about the value of the turnip.

The advantages arising out of the operation of the system here proposed, will be the following :—

First,—The rapid, extensive, and permanent improvement of poor waste lands, which now present every shade of poverty, from the pale grass to the sombre heath, while the straggling sheep and cattle, which are doomed to find existence on them, would, by their murrain-like appearance, clearly indicate the miserable character of the herbage upon which they browse. A person who has never seen the gloomy aspect of extensive moors, covered with heath, and here and there a patch of cultivation interspersed throughout the howling wilderness, can hardly fancy the effect of cultivating the whole surface. But, finding that this may be done, the landlord should act upon the noble principle of giving an ample remuneration, and should see that his tenants follow his example in relation to their labourers, which would be the only way to make them happy. When we speak of good wages, we mean such wages as would furnish sober and industrious families with all the needful comforts of this life. In other words, I mean a fair and just division of the produce of the soil.*

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* The real position of the immediate claimants is,
1st. The labourer.
2nd. The aged and infirm poor.

Secondly,—The turf or sward converted into ashes, will supply manure upon the very spot, which cannot be the case with bones collected in Russia, passed through the hands of merchants, and in the end, delivered to the British farmer at an excessive price. Even foreign rape dust is sold at the average price of oats, and yet all its fertilizing properties are exhausted in the second crop, and sometimes almost in the first.

Thirdly,—The turnip, from which, in after years, manure will always be supplied.

Fourthly,—A great saving of labour, one-fourth of the surface being enough for the growing of turnips.

Fifthly,—The Sward being left on three-fourths of the surface, and the destructive influence of poaching avoided, the twofold advantage of food in summer, and dry lodgings in winter, are secured.

Sixthly,—Improvement by Sheep.—Their habits and their size will render them well adapted to the exercise of grazing off the produce.

Seventhly,—Improvement of the Land.—Sterile lands, of every kind, at present in the state of nature, with five or six inches of soil, and those lands that have been tilled, and then abandoned, will not only be reclaimed, but will be made exceedingly productive.

3rd. The farmer.

4th. The crown—Taxes direct and indirect.

5th. The landlord—thus far, not *in a very enviable position on a poor soil.* Manufacturers and tradesmen in reality stand first, of whom clothes and implements are purchased.

Eighthly,—IN MOUNTAIN DISTRICTS—The system will be made to operate effectively, and where *animal labour cannot be applied, and where grain would not mature.*

Ninthly,—SPADE HUSBANDRY would then be carried to the HIGHEST PERFECTION, *and at the least expense*; indeed, it would be carried farther than it has ever been contemplated, and carried, if not to the very top of the highest mountains, at all events much higher than it has ever yet been attempted or designed.

Tenthly,—A GREAT INCREASE OF EMPLOYMENT, both in the field, and in every other kind of useful labour attendant thereon, the IMPORTATION OF GRAIN EXCEPTED. In truth, the system now proposed comes recommended by a hundred acts of Parliament, made expressly for the purpose of encouraging tillage, by giving a bounty on the exportation of grain, and thereby affording employment for the labourer. But I refer more immediately to those laws that went upon the principle of legal compulsion, in prohibiting the conversion of arable into pasture lands, and enforcing the breaking up of pastures which had at any time been arable, and all this, either by the force of a heavy penalty, or by a forfeiture of the land itself, "until the offence be reformed." I would even argue, that if nothing less than *a glut of grain* will satisfy the manufacturers, it will be better, indeed, infinitely better, that the glut should be the produce of British land, and British labourers, rather than that of foreign countries, SINCE THE MEANS OF DOING SO WILL BE BROUGHT SO COMPLETELY WITHIN OUR REACH ; and it would be much better to adopt such compulsory measures, than to interfere with the Corn Laws. This even might be accomplished by confining the compulsions to a portion only of the 6,000,000 of acres of pasture lands, previously alluded to at p. 81. Were we to ask the *working classes* whether they would prefer cheap bread and dear meat, with only half employment, or a full supply of bread, and meat, and employment, on liberal terms, they would undoubtedly prefer the latter.

Eleventhly,—A more even distribution of the Population over the land, which would appear from sacred history to be the reason why the Deity confounded the speech of the people in the building of Babel, and poured the tide of *emigration* into the hearts of mankind.

Twelfthly,—A great improvement of the climate in the neighbourhood of bogs and moors.

Thirteenthly,—A great increase of wealth in all those parts of the world wherever the system may be brought into active operation.

As all mankind must live upon the produce of the soil, the great prerequisite for human support, must be that of multiplying animal and vegetable produce on the face of the earth; and as the most fruitful soil is procured by the decomposition of animal and vegetable matter, that system which is the best adapted to produce the largest increase of animal and vegetable substances, must be the best adapted to multiply the means of supporting human life, and of supplying mankind with the largest quantity of human comforts. *Turf ashes* will supply the first and most convenient means of supporting vegetation, turnips and mangel-wurzel will supply the largest and most rapid transmutation of elemental substances into animal matter, and the largest supply of animal support, and will grow upon a larger extent of this world's surface, where the system may be applied, than will any other plant.

In treating on a subject of such amazing magnitude and exceeding great importance, the use of large numbers is entirely unavoidable, as they will of necessity involve large sums of almost every kind, and must involve the interests of society, and that to an unusual amount. In speaking of the area of the United Kingdom, we have given it at the total sum of seventy-three millions of acres, which to some minds may be confounding: but that we may be the better understood, and that our readers may perceive that what we have proposed is practicable, and may be rapidly acommplished, we will only suppose the whole kingdom to be compressed within the limits of a single farm of seventy or seven hundred acres, one half of it in cultivation, and the other in waste or in some equally unproductive state. In such a case, by the system here proposed, the farmer might immediately double his produce both of corn and cattle food, by transferring the whole of his sheep and cattle to the waste, to the poor pasture, and the ley, and might do it with as much facility as he would be able to convert his rich pasture lands into more fruitful fields of corn.

For my own part, I should not be able to conceive of any contrast that would be more striking, or any picture that would be more pleasing to the eye, or be more grateful to the heart of any real philanthropist, than that of the sloping sides of two neighbouring mountains, and each of them containing an area of a thousand acres,—one of them covered with brown heath, with only one lone hut upon its dreary surface, tenanted by a single shepherd and his hungry dogs, subsisting upon oatmeal and potatoes, and attended by a flock of half a thousand sheep, just kept alive from year to year; while on the other mountain, there are fifty cottages, containing each some half a dozen happy inmates, who have got every domestic comfort, and every other convenience which human industry can merit, or which the bulk of society can reasonably desire, and surrounded by a fleecy flock of five or six thousand sheep, as large and in as fine condition as the most celebrated sheep of Leicestershire.

But it would be still more interesting and impressive both to the imagination and the heart of a philanthropist, to contemplate the surplus population of our country in the light of such a contrast, or rather, making such a transit. First, behold them all assembled on those wild and mountain regions, ragged, starved, and feeble, and resembling human skeletons, while the spirits of those tens of thousands who have died for want of bread among their ancestors, are hovering over them to witness their proceedings: their starving flocks, just like themselves, composed of only skin and bone, attended by the skeletons of all among the former flocks, that on those dreary hills have perished by starvation. Behold the gloomy aspect of the heath, the frowning mountain's brow, the sad condition of animals just kept alive upon its dreary sides,—and, above all, the sad condition of the human tenantry, both in mind and body; presenting on the whole, a scene of wretchedness, both brute and human, which no mind can fully estimate, and which no single heart can fully feel.

But, on the other hand, how gratifying would it be to the anticipations of the true philanthropist, be he statesman or landholder, to look forward to the happy consequences of the system here proposed, when brought into general active operation. Let our statesmen, therefore, only be alive to the best interests of our country, and to the advantages of a system that will be equally congenial to the interests and the happiness of every class of the community, and be ready to afford the most effectual patronage, which is that of national and legislative encouragement;—and let men of capital be men of enterprise in an undertaking that will be as much to their advantage as to that of any other class;—and let every class of society feel the interest which they have got in the system, and take their own share in carrying it into immediate and full effect, and then every class will reap the benefit, and every class of society will then be rendered more happy. Lest it should be thought that I have attached too much importance (as the manufacturers and merchants will think) to the *resources* of British Agriculture, I beg leave to recommend them to reperuse the motto I have chosen. Nelson's maxim is admirable at all times, and it may be extensively applied; but it can never be adopted with so much propriety, or with so much advantage to mankind, and that without the least misapplication or alloy, as in the system of agricultural improvement which has been herein proposed. I beg leave therefore to conclude these Outlines, by reminding both statesmen and landowners—farmers and labourers—merchants and mechanics'—that "England expects every man to do his duty."

APPENDIX.

"Estimates of the annual produce of a nation, founded on a mere hypothesis, are entitled to little attention; because, even if they were right, there would be no means of ascertaining their correctness. We have no greater certainty of them, than we have of the opinions of those who tell us that the planets are inhabited; for if they be, there are no means of proving the fact.

"It appears to me, however, that an estimate could be made of the annual produce of the nation sufficiently correct for the purposes required, which might be effected through the medium of the assessed or property tax papers, in the event of a property tax being again resorted to.

"The plan which I would suggest is, to send down previous to the commencement of harvest, papers headed with the various kinds of produce, as wheat, oats, barley, flax, turnips, meadow, pasture, cattle, and sheep; and the farmer should insert the number of acres and the number of cattle, and whether he considered the grain crops to be above or below an average. These papers should be returned immediately after harvest.* The persons in the country to whom these papers were returned, might reduce the aggregate of all the papers of their respective districts into one, headed in the same manner; and the clerks of the commissioners of taxes in London, on the receipt of these papers, might form from them one general table. This paper, consequently, would present at one view the entire quantity of land in grain, and its probable produce; and a copy of it should be sent to every farmer. It might be printed on the back of the assessed or other tax papers; and consequently, occasion little or no additional expense. As these papers are sent down every year to the farmers, they would consequently be put in possession of the number of acres under grain throughout the kingdom at the least possible expense to government; to which might be added the average price. Thus every farmer would be supplied with a very interesting document, which would, to a certain degree, guide his next year's proceedings, as to the quantity and kinds of grain, &c. he should sow. It would be most serviceable to those, whose covenants and lands would permit of a change.

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* It would not be necessary to wait till the beans were reaped.

" As there is generally a month's difference between the completion of the harvest in the northern and southern counties, there would consequently be a month's difference in the returns. In order, therefore, that the agriculturalists and the public at large should reap the full benefit of such reports, the returns of each district or county should be inserted in the public papers as they came in, and the entire aggregate as soon as it could be made up.

" In the course of a few years, the information derived from this source would produce effects not less salutary than those that would arise from re-modelling the corn laws,* so as to make remuneration more to be depended upon.

" It would also have an equal tendency to protect the public against very high prices, by affording the producer the means of adapting the supply to the demand; an advantage never more necessary than at present, when the English farmer is rendered not only incapable of growing for exportation, but even of supplying the home consumption at a very low price."

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* This was published in 1823—it will therefore be perceived, that what is here hinted at, has been done.

Relative taxation, or observations on the impolicy of taxing malt, hops, beer, soap, candles, and leather, with a view of the manner in which the duties imposed upon them affect the different kinds of land, whether in grass or tillage, and their constant tendency to increase pauperism. See page 104.

On this subject (statistics), Chambers' makes the following observations in their valuable Journal of the 4th of May, 1839.

FIGURES OF ARITHMETIC, *v.* FIGURES OF SPEECH. —"The science which makes out these curious results is the science of *statistics,* one not known by name till the middle of the last century, and which is still in its infancy with us, although in high and well-regulated cultivation on the continent. It is the glorious tendency of this science every where to diminish the regions of the disputable. The *disputable* being, that which occupies most time, thought, and energy, it is of the greatest consequence that its limits should be narrowed, for then there will be the more time, thought, and energy, to devote to the *ascertained.* If we reflect a moment on the things which chiefly occupy human attention, we shall find that they are things on which the demonstrations called for in the exact sciences have not as yet been adduced. Years pass on, and men are still found wrangling on those subjects, each man having only his own vague impressions or prepossessions as grounds for the views he takes, and defending these views, or, as he calls them, opinions, with as much pertinacity, as if they were based on the clearest facts. Silently, day after day, a set of pains-taking men are garnering up arithmetical truths on most of the great subjects of human concernment, and thus preparing the way for a mighty change."

Extracts from Dr. Richardson's Letters to Sir James Stewart Denham, Bart. of Coltness; Edinburgh Farmers' Magazine, November, 1819:—

" You came yourself to Clenfeile in the height of my hay harvest, late in October, and you saw my fiorin crop in every stage; much in trampcocks, some under the process of saving, much yet to cut, and in different places mowed before you for your satisfaction. The weight of the sward, with the crowded lapcocks astonished you; and when I asked you the question I put to all fiorin visitors, 'are your expectations answered?' You replied, 'far exceeded.'

" I cannot help reminding you of the answer an agricultural servant you brought with you gave: you asked, when alone with him, 'what he thought of the fiorin crops he had seen that morning?' He replied, 'Sir, it is all nonsense, for they will not believe one word of it when we get home.'

" Having thus obtained full conviction yourself of the great value of fiorin grass, you determined to avail yourself of it at home, and to encourage your countrymen to follow your example; even before you left my house, you sent orders to Coltness to commence the necessary preparations; and on your return to Scotland, with all the zeal of a missionary, you laboured to induce your countrymen to commence the cultivation of a grass with which you were as yet unacquainted, and of whose great value to the agriculturalist, you yourself had obtained full conviction.

"The success that attended your exertions is recorded in the agricultural annals of your country: in these, we find the premiums obtained by different fiorin cultivators, with the amount of the crops for which they were awarded, most respectably attested by the leading members of your Agricultural Societies, sent on purpose to inspect them, and which they found very far superior to any hay crops hitherto raised in Scotland.

"For so far the culture of fiorin was limited to the low country; to a field, and climate, in which other valuable vegetables could be raised, abundantly rewarding the labours of the spirited agriculturalist.

"When your attention was first roused on the fiorin subject, the promises I made to the world, had reached you, and induced you to investigate, in person, the probability of my being able to make them good.

"First. That this newly noticed grass would produce crops of hay, treble the amount of those raised from any other grass.

"Secondly. That its hay was of superior quality, more abounding in saccharine, and far more grateful to cattle than that from any other grass.

"Thirdly. That fiorin grass could be made into hay at all seasons; and by its antiseptic quality, prevented from rotting at a time of the year, when it was impossible to save other hay.

"Fourthly. That peaty soils were peculiarly adapted to the cultivation of this grass, whether on the original surface, or upon that left when the turf was cut away.

" Such were the inducements I held out to the world, to encourage the cultivation of this new grass; they tempted you to inquire farther into the subject, and having obtained full conviction of the truth of each of these positions, you determined to exert yourself to make your countrymen partakers of benefits which you saw were certain; and you obtained a promise from me, to visit you in the ensuing spring, to assist you; a promise, I fulfilled, with much satisfaction to myself.

" I am now opening a new field, hitherto almost untried; and I shall compare the prospect of success it affords, with that yielded by fiorin grass when cultivated on lower grounds, at the period when you were captivated by the magnificence of its crops, and satisfied you could raise similar ones at home.

" I have just stated four important properties of fiorin grass, which give it great value when cultivated in our low countries, in the usual field of the agriculturist's exertions.

" I now invite him to rise to greater elevations, and have to shew the probability, approaching to certainty, that this grass will possess these same four properties, to the same value, in higher regions, uninjured by the severity of the new climate in which it is fostered.

" My geological pursuits leading me often into mountain districts of great elevation, I was surprised and amused, to find myself always accompanied by my agricultural mistress, fiorin grass — in the same health and vigour, at all elevations, even the highest I ever ascended to; while the other common grasses, gradually disappearing, finally vanished, leaving the fiorin solitary on the summits.

" I was even once able to shew some respectable members of the Irish Farming Society, (as I state in the

39th page of my Essays), that the luxuriance of fiorin stolmes increased as we approached the summits of the mountain ridge.

"Thus encouraged, I proceeded to experiment, and thence to practice.

"By the favour of my late noble friend, the Marquis of Abercorn, I was indulged in laying down considerable patches of fiorin grass, far up in his Lordship's peaty mountains.

"The luxuriance of the crop was equal to that in our richest low grounds, as the gentleman who accompanied me to the mountain plots I had laid down, authorised me to say; and his lordship's coach horses shewed the same predeliction for the mountain fiorin, we had always found given to its lowland hay.

"Practice on a more extended scale was necessary, and another noble friend gratified me to the utmost extent of my wishes.

"The Marquis of Hertford was so good as to direct his agent to enclose and cultivate, under my directions, a field of many acres, (nine or ten as I recollect) also very high in his mountain—the result was the same,—magnificent crops of fine hay for years.

"I shall now compare our prospects from mountain crops of fiorin, and try them, as I promised, by the four tests, by which the superiority of fiorin over other lowland hay, was established.

"As to the first, it appears by both experiment and practice, that mountain and lowland fiorin are equal in luxuriance.

"Second. And also that the predeliction of cattle for mountain and lowland fiorin, is the same.

"As to the third, the power of its hay to sustain mountain severities; I visited Lord Hertford's mountain meadow in March, 1813, and found the numerous trampcocks standing in it in the highest preservation.

"And when this meadow was inspected in 1814, the report to me was curious—that the hares had nearly undermined the trampcocks—that their surfaces had vegetated, and that they resembled so many green mounts, and that all the interior hay was in the highest preservation: the vegetating surface, I myself know, was in the best possible order for immediate consumption.

"As to the fourth point, aptitude of fiorin for peaty soils, I must observe, that both Lord Abercorn's plots, and three fourths of Lord Hertford's meadow were pure peat.

"Thus it appears that this strange vegetable will carry with it, into our mountain districts, each of the four properties I have stated, which gave you so high an idea of its value, when cultivated in lower countries.

"Shall I then be able to persuade you to commence another mission—you set out with, at least, the same advantage you enjoyed on your former, seven years ago.

"I have often stated that there are three measures essential to the success of fiorin cultivation in any grounds, severe drainage—persevering weedings—and frequent top dressings. Nine-tenths of the failures which have been complained of, I have found to arise from the neglect or faint execution of these necessary operations.

"The spontaneous meadow, called after the noble Earl's, bore this last year, 1818, its fourth successive crop, and produced six tons one hundred, at eight stone of fourteen pounds to the English acre, of as fine and as dry hay as I ever saw; as is established by the affidavit of the mower, who saved and weighed the crop, which stands in trampcocks in the open field, to satisfy curiosity for its quality, and to show that fiorin cocks can remain more than a year in the open field without injury.

"The Bishop of Down was so good as to call upon me yesterday: his Lordship told me he had taken much pains to ascertain the produce of his seven or eight (as I think) Irish acres of fiorin meadow last year, 1818, and found it to be nine tons dry hay to the Irish acre, very, very near six tons to the English.

"Having well enclosed his intended meadow, treated as I so often directed, that is, well drained and top dressed, let him, as a part of his fence, erect a shed, opening outwards to his mountain, and inwards to his meadow, that his cattle, when loosed, may get out to air themselves, and that the hay standing in the meadow may be brought into the inside, to be thence given to the cattle regularly. Fiorin hay, as I have repeatedly proved, standing the winter in trampcock in the open field, with perfect safety of course we are saved the trouble and expense of storing and ricking our hay in short days and uncertain weather, as has been hitherto the constant lowland practice.

"When our pupil shall have executed this easy task he will find I have performed my promise of enabling him to maintain, in comfort, through the winter, every beast his mountain grazed in summer.

"So far I have limited myself to the same stock, and the same style of cattle, hitherto in possession of our mountains.

"My second and recent discovery will, I am confident, enable mountain proprietors to change the style of cattle they have hitherto been used to feed, and, instead of limiting themselves to breeding and rearing cattle, will now proceed to fatten.

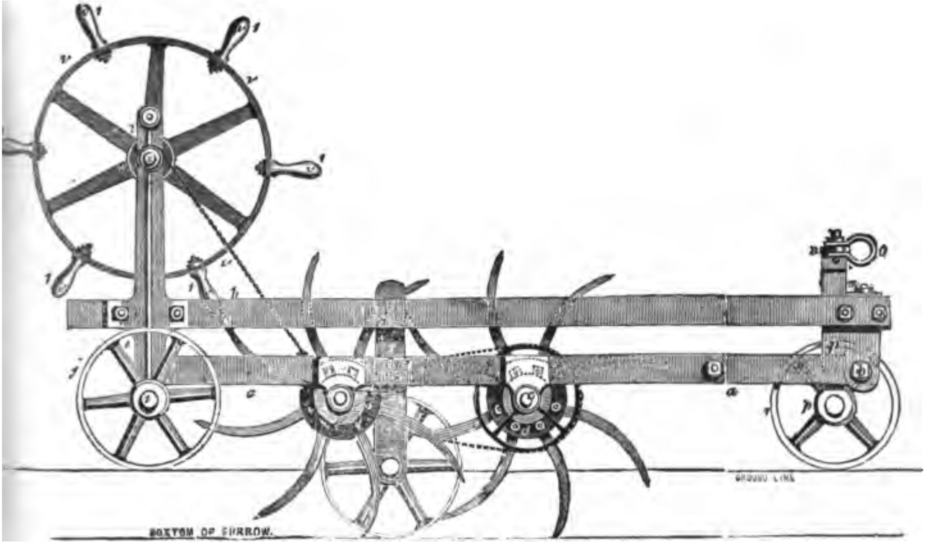
"What! fatten on coarse mountain grass, when we know that the most luxuriant coarse pastures of our moist bottoms are insufficient to promote obesity!

"No doubt the coarse spritty one-pointed grass, common to moist bottoms, and moist mountains, will not fatten, but in my 'Essay on Grassy Mountains,' I shew the facility of changing this coarse herbage into a more kindly one, and we know that cold itself is not hostile to obesity, as the animals yielding most fat and oil, whether on sea, or on land, are the inhabitants of cold and even arctic climates."

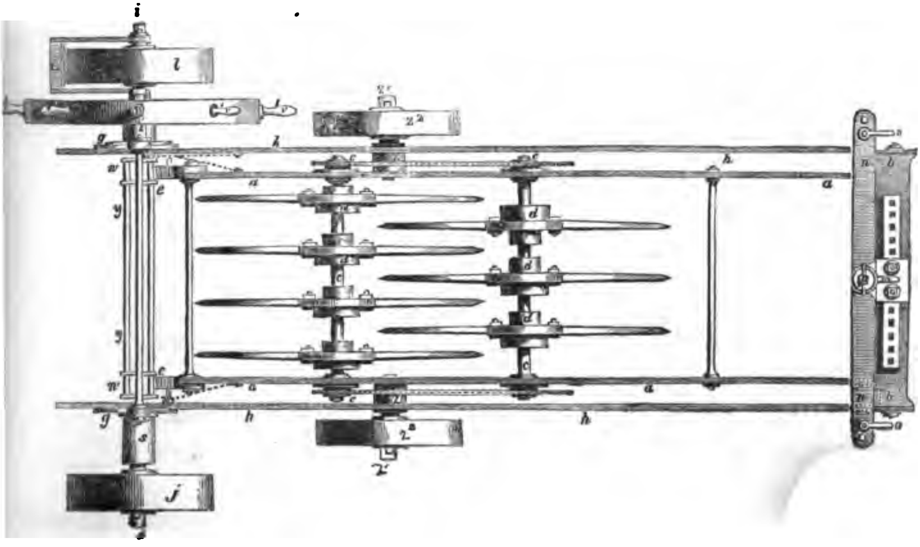
VAUX'S PATENT REVOLVING HARROW,

MANUFACTURED AND SOLD BY GREEN & CONSTABLE,

No. 36, *King William Street, London Bridge.*



**The Letters in the Engravings are intended to elucidate the Specifications of the Patent.
A Copy of the Specification will accompany the License.**



The important peculiarities of this implement consist—

1st. In each set of tines passing between the other set, and clearing each other of couch-grass, &c.

2nd. In the tines descending the full depth the ground is ploughed; and having two actions, one horizontal, and the other circular, or revolving.

3rd. The perfect manner in which it pulverizes the ground, at the same time leaving it as light as it is left by the plough; for it will be perceived from the drawings, that no substance can escape unbroken, larger than the distance at which the tines are from each other when in action, while passing each other.

4th. Separating the couch-grass from the earth, *and raising it to the surface.*

5th. Not requiring to be lifted up to get rid of the couch-grass, &c. as is the case with the drags and harrows now in use. Two defects arise from this lifting up;—First, the manual labour required, the want of which, in due time, creates both an extra quantity of animal labour, and causes the work to be executed in a very imperfect manner, occasioned by the tines being choked with couch-grass. Secondly, the land either entirely or partly escaping the action of the tines when being lifted up for the purpose of getting rid of the couch-grass, and mould too, if the land be not quite dry. In addition to these defects in the old implements, especially after or upon the first ploughing, in strong soils in particular, and on light soils if there be much couch-grass, the tines do not penetrate the full depth that the ground is ploughed, so that it is only after the second and other ploughings, several draggings and harrowings, that these implements do what the Revolving Harrow performs in the first and every other instance—penetrate quite through the furrow-slice.

6th. The facility with which the tines of the Revolving Harrow are thrown out of action while turning on the headlands, and for the purpose of travelling from one field to another, are too obvious to require farther explanation.

As to the size, it may, with advantage, be made any breadth, from eighteen inches to five feet; any breadth less than four feet will, however, only be used on particular occasions,—that is, when the land is too wet for horses or oxen to travel on the surface. On such occasions, one about eighteen inches wide will be the best, which is so constructed that it operates upon the newly ploughed furrow-slice while the horses walk in the furrow; effected by drawing from the left side of the front or head-piece of the frame, with a cock or shackle similar to those used for ploughs, by which, and with the aid of a wheel attached to the inner frame, which travels in the furrow, the tines are made to operate exactly upon the furrow-slice. This wheel also prevents the tines descending deeper than the plough has gone, whilst the weight of the harrow causes the tines to penetrate exactly through the furrow-slice, but not deeper. With the harrow in this form, land may be pulverized and cleared of couch-grass (which is the object of all tillage), when so damp that neither the one nor the other could be otherwise accomplished. In fact land may be completely prepared for seed before a commencement can be made with the common drags and harrows. By attaching a rake, or a small common harrow, to the hind cross bar, and by picking or raking off the couch immediately after the harrow, a complete fallow may be made without either man or beast setting a foot on the newly tilled part, and the ground left as light as it is by the plough; whilst, if in the damp state here alluded to, it were worked with the common drags and harrows, it would be poached, or left *sadder than before it was ploughed*; advantages that will be appreciated by no class of farmers more than by those who raise large quantities of potatoes, mangle-wurzel, Swedish turnips, &c., for which the ground requires tilling long before it is sufficiently dry.

In consequence of the small quantity which *this* harrow is capable of tilling as compared with a larger, it will only be used when land is not in a fit state to receive the tread of horses; probably, with the exception of land in a very foul state, by acting upon so small a quantity at once, it may be more effectual than a larger.

As to the dimensions of the larger sort, every farmer may exercise his own discretion: from four to five feet wide will probably prove the best. In using these harrows on stiff soils, or on light soils full of couch-grass, it may be necessary to take out every other tine from the nave of the front set—being fastened by bolts and screws, this will be easily accomplished, without the aid of a smith; or one set of tines with the nave may be taken off the axle, and the rest adjusted.

There is a provision for throwing nearly the whole weight of the outer frame upon the tines, by placing the bolt attached to the upright part of the frame on the opposite side of the spoke of the wheel to that on which it is placed for the purpose of keeping them out of action, when they do not penetrate through the furrow-slice, which may be the case on very stiff or foul soils when not quite dry.

As to the management, nothing more is required than to raise the tines out of action, and to let them down at every turning, which is done by turning the hand wheel once round and placing a bolt, provided for the purpose, behind a spoke of the wheel.

It is necessary to observe that the tines should always be raised out of action before the front wheels begin to turn on the headland, otherwise they will be bent. The superiority of the Revolving Harrow over those now in use, may easily be comprehended, both as to the power necessary to accomplish the object required, and the effect produced, by supposing a man to place a three-pronged dung-fork at one side of a piece of ploughed ground, and try the difference of the force required to push it through in the same manner the tines of a drag are forced through; then let him, with the same tool, fork the ground over in the ordinary way, and it will be perceived that forcing the fork through may be compared to the manner in which the old drag performs its operations, and that of forking over the ground to the work of the Revolving Harrow. This is so obvious, that ground which requires four ploughings, (the average number independant of the seed furrows) dragging, and numerous harrowings with the old implements, to make a fallow, may be as effectually prepared by two ploughings and less than half the draggings and harrowings* with harrow; consequently will be a saving, in a very short time, of a sum far exceeding the cost of this implement.

The materials of which the Revolving Harrows are constructed consist of the best wrought and cast iron, the former being as three to one of the latter; part of the frame-work may, however, be constructed of wood, which will greatly reduce the cost.

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* I say draggings and harrowings, because the Revolving Harrow ANSWERS ALL THE PURPOSES, AT ONE OPERATION, of a spiked roller, the heaviest drag, and the lightest harrow of the common sort; it will, therefore, be found a valuable acquisition to break the furrow-slice of ley, clover, and other stubbles.

The weight will vary from about 5 to 15 cwt.

Country Smiths will, on application to Mr. Daniel Green, No. 36, King William Street, London Bridge, Agent to the Patentee, be supplied with castings, and a licence to manufacture.

The Revolving Harrow may also be had of Messrs. Gibbs, Seedsman, Half-moon Street, Piccadilly.

ADVERTISEMENT.

As the delay which has attended the publishing of this Work, would seem to be not in accordance with the great importance which is attached to the discovery of which it treats, the author deems it as a duty which he owes to his friends, the public and himself, to say, that he had no control over those circumstances which occasioned the delay: and as a compensation to the public for that unavoidable delay, the author begs to say, that no charges will be made for the use of his invention in 1840-1; and that it will not be needful to apply for any letters of license to adopt the system until about the Midsummer of 1842; and that no charges for payment will be made until the close of that year.

The novelty of the plan which is proposed, as well as of the Patent granted for the exclusive right of exercising it, will no doubt create inquiries as to whether it is a legitimate subject for a patent. These circumstances, together with the almost universal prejudice which is entertained against all innovations, have induced the Patentee at once to furnish his readers with the best information in his power: as the opinions stated below, have been given by persons of the highest respectability, and of long and extensive practice as *patent agents*, whose time has been exclusively employed in that department; and, therefore, it is believed that the deliberate opinions of such persons will be decisive.

Mr. William Carpmael is requested to consider the Specification of Mr. Vaux's Patent, and to give his opinion as to whether the Invention is such an one as to support a Patent.

"I have well considered the Invention as set forth in the Specification of Mr. Vaux for Fertilizing Land: and in answer to the case as submitted to me, I would say, as a general principle, that any new process, or new combination, or manipulation of Instrument carried on by the art of man, working to produce beneficial results, not previously attained, is the subject of a patent; and to that extent the various legal decisions have come to. The words 'any manner of New Manufacture,' in the statute of James the 1st, have been read to mean any new process in Chemistry—any new machine—any new compounds of known materials—any new application of known matters, instruments, or processes to new purposes so long as a beneficial result is obtained—as far as my practice goes: the main question on which, all cases in Court have turned, has not been, what is the quantity of Invention, but what are the advantages of the invention.

"If it could be clearly shown from practice, that the process of treating land is new, and that it is useful, I can see no reason (looking at the cases which have been decided) against the Patent being sustained.

"WILLIAM CARPMAEL,

"*Lincoln's Inn.*"

" *Chancery Chambers, Quality Court*,
" CHANCERY LANE.

"SIR,

" In answer to your favour of yesterday, I would observe, that after having given the subject a careful re-consideration, I come to the same conclusions as were expressed in my Letter of June 29th, 1839, respecting the then contemplated American Patent; namely, that a Patent may be sustained for your mode of conducting 'a new and useful process in tilling and fertilizing Land.' .

"The English decision on Patent cases contain the same doctrines as the American, but couched in somewhat different language.

" In America, the subject of a Patent is held to be 'any new or useful art, machine, manufacture, or composition 'of matter, or any new or useful improvement on any art, machine, or composition of matter.'

" In England, the same doctrine is expressed, in the Statute of Monopolies, as explained by various Judges, but it will be enough to cite the authority of one.

" The Statute declares the subject of a Patent to be 'any manner of new manufactures.'

" Lord Chief Justice Eyre in the case of Boulton *v.* Bull, explains the term 'new manufacture,' to include all new artificial manners of operating, with the hand, or with instruments in common use, and new processes in any art, producing effects useful to the public.

"Now, your improvements in tilling and fertilizing Land, consist in a new manner of operating with the hand and with instruments in common use, constituting a new process in art, producing effects useful to the public; and, therefore, I know of no Patent more certain of being established, in the event of its being brought into an English Court.

"I differ, entirely, with your objector, who urges that you do not produce a saleable commodity, for it is certain that you take poor barren land as a raw material, and in a few years manufacture it into rich fertile land, which every one knows is always a saleable commodity in this country.

"I am, SIR,
"Your humble Servant,
"JOHN ISAAC HAWKINS."

Mr. Vaux's Patent "Improvements in Tilling and Fertilizing Land."

"I have perused Mr. Vaux's Pamphlet explanatory of his patent improvements in 'Tilling and Fertilizing Land,' and assuming that the specification enrolled is to the same effect, or nearly so, as the portion of the pamphlet headed 'Introduction or Outline of a Specification,' I entertain no doubt as to the perfect validity of the patent.

1. The improvements may be considered as of the of processes in art, carried on by known implements, acting upon known substances, and ultimately producing certain other substances also before known, but all after some new modes or methods, by which certain new and useful effects are realized. That such processes are valid subjects of patents, see Lord Chief Justicc Eyre, in Boulton v. Watt and Bull (Davis, 208,) and Lord Chief Justice Abbott, in the King v. Wheeler, (2 B. and Ald., 349.) The processes in this case may not be things vendible by themselves, as an engine or instrument, (unless indeed a copy of the specification with licence to use may be so considered); but that is a circumstance of so little importance that Lord Mansfield has gone so far as to say (4 Burr 2397) that such processes or methods must be 'detached from all physicial existence whatever,'

that is to say, must be the offspring of mind or invention, and capable of being made intelligible by words or drawings, without the instrumentality of the things themselves. Hartley's Patent for protecting buildings from fire, consisted in a *method* merely of disposing of iron plates for the purpose, a description of which method and licence to use it, were of course the only things he could hand over to a licensee; but the patent was held good.

2. The processes described by Mr. Vaux are to the best of my knowledge entirely new. And

3. The effects produced are not simply useful but of the highest national value and importance.

"J. C. ROBERTSON.

" 166, *Fleet-Street.*"

The following extracts from the *Gloucestershire Chronicle* in the beginning of February last, are in so much accordance with the opinion of Lord Reddesdale, (note page 82) and with those of Mr. Hawkins, that I am led to introduce them to the reader before I close this volume:—

" But after all, one of the greatest blunders these persons commit, is their fancying that corn is not a manufacture; and if there be an anti-corn-law clothier in Gloucestershire, let me but put the case to him by analogy. Let him compare the first ploughing of a field, the extracting of weeds and couch-grass to the first breaking up, picking, and cleaning of a bag of wool. Then compare the ploughman to the weaver, the shuttle to the plough; every furrow being somewhat similiar to a thread thrown across the warp ; and when the field is finished, imagine it a piece of broad-cloth ready for the various processes of dressing, picking, cleaning, and pressing, till in time a beautiful golden pile is raised upon the surface, every fibre of which is 'the staff of life.' Well, after reaping, thrashing, winnowing, &c., the corn is taken to market and sold in the bulk, or by sample, just like cotton or woollen cloths are, to corn-factors or millers. The miller and baker cut it up and fashion it for inside lining of the stomach, whilst the tailor is converting the cloth (barring the cabbage), to cover the back. Now if the farmer be not a manufacturer who is?"

Then what after all are the landlords of England, but master manufacturers of the first article of life—bread stuff?

Form of Application for persons desirous of using Mr. Vaux's Patent for Tilling and Fertilizing Land.

SIR,

I am desirous of adopting your Patented system of Tilling Land; and shall therefore be obliged by your written permission to do so; for which I undertake to pay you 2s. 6d. per acre per annum.

Form of License to use the new system for Tilling and Fertilizing Land.

SIR,

I hereby License you to adopt my Patented system of Tilling Land, on your paying me 2s. 6d. per acre per annum, as agreed by you in your letter of the

I am, &c.,
T. VAUX.

I have been thus explicit in order that the farmer might know every thing which is necessary to be done.

ERRATA.

Page	41	12th line from the bottom, for London read Loudon.
,,	68	8th line from the bottom, following for fallowing.
,,	71	3rd line from the bottom, supply the word are.
,,	76	3rd and 4th lines, for " keep a good stock of hay between the rows of turnips," read " mow the grass between the rows of turnips."
,,	81	1st and 2nd lines, three and a half sheep, instead of five.
,,	126	7th line, for woorts read roots.
,,	165	Bottom line for hot read not.
,,	180	Omit the following, " for the present year, (1840) much may be done in the month of March."
,,	182	Read, 32 parishes for 30.

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